metals review

the news digest magazine

published by the american society for metals

Volume XXIX No. 5 May, 1956

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Metals Review

VOLUME XXIX, 5 May, 1956

THE NEWS DIGEST MAGAZINE

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ASM REVIEW OF METAL LITERATURE

Explains Chromizing in Pennsylvania

R. P. Seelig, Chromalloy Corp., Presented a Talk on "Chromizing and Other Metal Coating Processes" at a Meeting of Northwestern Pennsylvania Chapter. Shown are, from left: G. E. Monkern, secretary-treasurer; G. D. Kimpel, vice-chairman; Mr. Seelig; and O. Ehlers, who was program chairman

Speaker: R. P. Seelig
Chromalloy Corp.

Richard P. Seelig, executive vice-president, Chromalloy Corp., spoke before the **Northwestern Pennsylvania Chapter** on "Chromizing and Other Metal Coating Processes".

Mr. Seelig defined chromizing as a method by which chromium is diffused into the surface of a metal. The process is carried out by a method similar to pack carburizing.

The "chromizing" process should be considered where parts are subjected to corrosion, wear or oxidation at elevated temperatures.

Comparing the chromizing process with electroplating, immersion and spray coating, it was noted that with the chromizing process the chromium is diffused into the metal, forming an intimate bond, whereas by other processes the bond is superficial and the coating may be brittle, have discontinuities or other defects.

The process is applicable to any low carbon steel. Chromizing is not recommended for free machining steels (leaded) or for high-sulphur steel (over 0.15%). The depth of case may be up to approximately 0.002 in., with 45% chromium at the surface decreasing to zero in the core.

Chromizing is especially applicable to powder metal parts since it penetrates the pores near the surface as a result of the gas reaction. Other methods of coating powder metal parts fill the pores with plating solution which sometimes leads to failure in use.

A highly wear resistant surface can be produced on high carbon steels and cast irons where the chromium combines with the carbon of the base metal to form chromium carbide.

The surface hardness of the case is dependent upon the carbon content of the base metal. Since the case is usually less than 0.002 in. thick the finished part should not be ground, but finished by lapping, tumbling or other polishing methods.

Several slides were shown on the application of parts that had undergone the chromizing process, some of which were dies, parts of soldering iron, strip heaters and plate burner. **—Reported by Marvin T. Baker for Northwestern Pennsylvania.**

Explains Ferrous Welding At Joint ASM-AWS Meeting

Speaker: Robert H. Aborn
United States Steel Corp.

At a meeting of the **Chattanooga Chapter** held jointly with the American Welding Society, Robert H. Aborn, director of fundamental research, United States Steel Corp., spoke on "Ferrous Welding". Dr. Aborn's discussion combined an explanation of welding phenomena and a metallurgical explanation to account for the observed properties of welds.

The speaker began by outlining some 32 processes currently used in welding, based on heat source and presence or absence of pressure. In explaining various factors that influence the properties of welds, he described the role of nitrogen, oxygen and hydrogen introduced into the molten metal in an unprotected or unshielded arc in forming brittle compounds or making tears when precipitating from the cooling metal. Shielding and low-hydrogen coatings minimize this behavior. Hot cracking generally originates from deficient intergranular cohesive resistance to shrinkage stresses during and shortly after freezing.

The heat affected zone was pictured and the roles of the rates of heat input and heat dissipation explained. The ratio of these rates determines the cooling rate and thus the final structure and properties. This explains why gas welding tends to produce the most ductile welds. In alloy welding, preheat and postheat control are important.

For the future of welding, Dr. Aborn sees improvement in electrodes in regard to thermal stress relieving needs, and the increasing use of contact electrodes and automatic processes, particularly the inert-gas shielded consumable electrode process.

As an added feature, Dr. Aborn showed high-speed color motion pictures of welding arcs which revealed arc action and showed the transfer of molten metal into the puddle with visible differences in spatter and arc characteristics from one type of coating to another.**—Reported by John H. McMinn for Chattanooga.**

Schaefer Presents Edmonton Charter

The Charter of the Edmonton Chapter Was Presented by National President A. O. Schaefer (Center), Director of Research, Midvale-Heppenstall Co., to W. D. Suiter (Left), Chairman of the Chapter. National Secretary W. H. Eisenman was also a guest at the meeting during which Mr. Schaefer spoke on "Importance of Standards in Industry". Over 90 members of the chapter attended this important meeting. (Reported by G. W. Harris)

New Films

Ductile Cast Iron

A sound, color motion picture, which runs for 15 min., shows the microstructure of ductile cast iron, a cast iron wherein the graphite occurs in the form of spheroids rather than in the conventional flake form. The limits of stress and strain for ductile cast iron are charted by graph, and its mechanical properties which are similar to steel are shown by a series of tests. Ductile cast iron is shown in specific applications that include gears, pinions, crankshafts, plow points, pressure castings, clutches, and many other uses within the agricultural, electrical, automotive, machine tool, power, fluid handling and other industries.

Prints of the movie are available free of charge. Bookings can be made through Rothacker, Inc., 729 Seventh Ave., or the International Nickel Co., Inc., 67 Wall St., both in New York City.

A Brighter Tomorrow

A 16-mm. sound technicolor film produced by the Bart-Messing Corp., Belleville, N. J., which deals with the electroplating phase of metal products finishing. The film takes the viewer on a 30-minute visit to the various plants of the company where a number of interesting metal finishing processes and applications are observed and described. Prints of the film are available free of charge by writing directly to the company.

Presents Titanium Talk in Boston

"Titanium" Was the Topic of a Talk Given by W. W. Minkler, Titanium Metals Corp. of America, at a Meeting in Boston. Present were, from left; Mr. Minkler; J. L. Martin, technical chairman; and J. L. Morosini, chapter chairman. (Photograph by H. L. Phillips for Boston Chapter)

Speaker: W. W. Minkler
Titanium Metals Corp. of America

Ward W. Minkler, assistant manager of market development, Titanium Metals Corp. of America, presented a talk entitled "Titanium—the Metal and Industry" at a recent **Boston Chapter** meeting.

Titanium has long been used in the form of titanium oxide as a pigment for paint and also as a die. Recent publicity concerning titanium, however, has been chiefly devoted to the metal and its alloys. The wide interest in metallic titanium has been prompted because its density is 56% of steel; it has good strength to 1000° F.; has excellent corrosion resistance; and there is a great abundance of ore available.

The first industry to recognize the potentialities of titanium was the aircraft industry and today over 95% of its production is consumed by this industry. The use of titanium for compressor blades was one of the earliest applications.

The production of titanium mill products has increased from only 2000 lb. in 1950 to 3,900,000 lb. in 1955. It is expected to exceed 10,000,000 lb. in 1956. The production of titanium was made possible by the development of the Kroll process, by which titanium ore is treated to form titanium tetrachloride ($TiCl_4$) which in turn is reacted with metallic magnesium to form titanium sponge. The magnesium chloride formed by the reaction is reclaimed and reused.

Applications in other than the aircraft industry are many. Due to the current price ($13.40 per lb.), however, the uses are not yet as extensive as they will be when production costs are further reduced. Chemical equipment and cobalt processing plants are taking advantage of the metal's excellent corrosion properties. Alloys of titanium have been developed which have resulted in improved mechanical properties both at room and elevated temperatures.

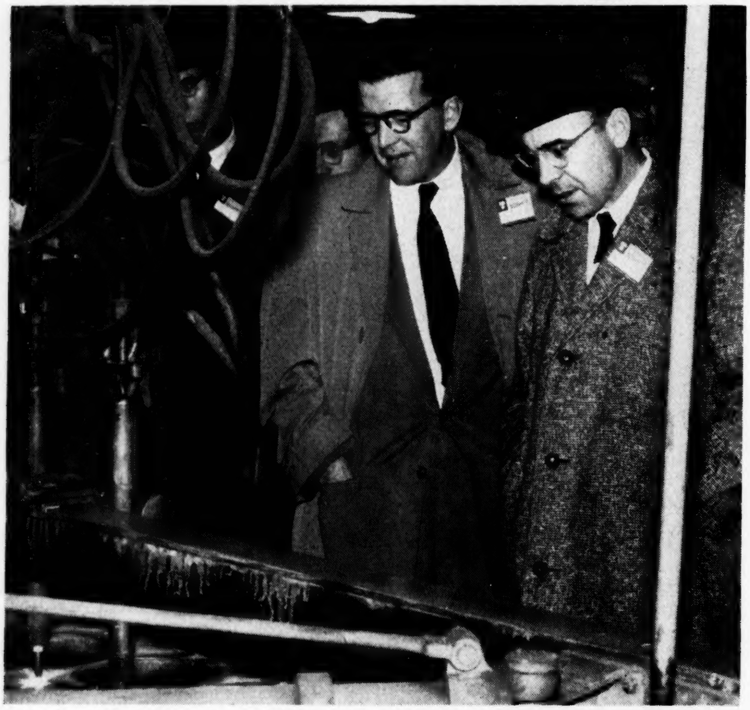
Mr. Minkler also demonstrated the effect of heat treatment of titanium alloys as a method of improving the properties.

A discussion period followed the talk and resulted in active participation by the audience.—**Reported by William H. McCarty for Boston.**

A.S.M. at the Powder Metal Show

The American Society for Metals Had an Active Display in the Metal Powder Association Show Held Recently in Cleveland. Shown in conversation during the meeting, from left, are: Robert L. Ziegfeld, secretary-treasurer, M.P.A.; Kempton H. Roll, active in the New York Chapter A. S. M.; Morris Boorky, re-elected president of M.P.A. and chairman of the board; and D. M. Borcina, A.S.M. member and assistant to secretary, Lead Industries Association. Mr. Boorky is president of Presmet Corp., and an A.S.M.'er

Hartford Members Visit Sub Shipyards



Members of the Hartford Chapter, Warren Ide (Left) and Ronald Johnson, Observe a Demonstration of a Camograph at the Electric Boat Division of General Dynamics Corp. During a Recent Visit. More than 165 members made the trip to the shipyards at Groton, Conn. (Photo by Electric Boat Div.)

Speaker: E. R. Eberle
Electric Boat Division

About 165 members and guests of the **Hartford Chapter** visited the Electric Boat Division of General Dynamics Corp. during a recent meeting. Areas visited included the research and development laboratory, North and South Yards, fitting-out docks, foundry, machine shop, and submarine library and historical exhibit. Two nuclear-powered submarines were viewed under construction.

Cdr. E. R. Eberle, retired, U.S.N., from the research and development laboratory of Electric Boat, delivered an address on the "Development of Submarines". He traced the history of submarines from Alexander the Great's diving bell through Bushnell's Turtle of 1775, Fulton's submarine of 1800, and Huntley's in the Civil War. All these submarines were man powered, and it was not until the invention of the internal combustion engine, storage batteries and electric motors that submarines became successful. About 1895 John Holland started working on submarines and the first submarine delivered to the U. S. Navy in 1900 was built by the Holland Torpedo Boat Co., which shortly thereafter became Electric Boat.

The Whitehead torpedo was also produced during this period and the submarine proved an ideal weapon for carrying and firing it. With the development of anti-submarine devices, such as sonar listening equipment and the airplane, it became standard submarine practice to surface at night and run with diesel power and charge the batteries, and submerge during the day and run with electric motors powered by the batteries.

With the advent of radar during World War II, submergence day and night became necessary. The snorkel partially solved this by permitting intake of air while submerged, but the submarine still had relatively poor endurance under water. Germany tried hydrogen peroxide powered boats late in World War II, with limited success. The basic concepts of submarine design followed those of John Holland until the famous message from the Nautilus in January 1955 that they were "under way on nuclear power".

The Nautilus was developed jointly with the U. S. Navy and Westinghouse, who started the engine and reactor in 1948. Essentially the Nautilus is powered by a steam turbine and the steam is obtained from the heat of a uranium reactor. Shielding is a problem which was solved by using all-welded construction and canning all valves and pumps. The boat also has diesel and electric motors for auxiliary power and is fully equipped with detectors to monitor any radiographic leaks. Commander Eberle quoted from Admiral Rickover's speech on the proven capabilities of the Nautilus.

For the future beyond the Nautilus, the speaker predicted high-speed cigar-shaped boats with no conning tower. Since nuclear-powered submarines only have to surface for landing, the conning tower is no longer necessary. Noise reduction is another problem needing attention. Also submarines are being developed to carry missiles, planes and as radar pickets. Commander Eberle thought the outlook for the future of the submarine was good because of its unique capabilities. **—Reported by B. L. Taft for Hartford Chapter.**

Program for Southern Metals Conference at Winston-Salem, N. C.

The schedule of meetings to be held during the Southern Metals Conference at the Hotel Robert E. Lee, Winston-Salem, N. C., May 7 to May 9, including titles of papers and the speakers and their chapter affiliations is as follows:

Monday, May 7

1:00 p.m. Electric Furnaces Versus Openhearth Furnaces, by J. E. Wilbanks, Atlanta Chapter.

1:45 p.m. Carburizing Highly Stressed Parts, by H. T. Davis, Old South Chapter.

2:30 p.m. Nitriding Stainless Steels, by W. T. Tiffin, Jacksonville Chapter.

3:15 p.m. Predictable Behavior of Welded Structures, by T. J. Dawson, New Orleans Chapter.

Tuesday, May 8

1:00 p.m. Use of Radio-Isotopes for Radiographic Inspection, by J. M. Shilstone, New Orleans Chapter.

1:45 p.m. Boron Steels, by J. R. Kattus, Birmingham Chapter.

2:30 p.m. Replacement of Castings by Power Metallurgy by T. L. Robinson, Old South Chapter.

3:15 p.m. Material Problems in Nuclear Reactors, by W. D. Manly, Oak Ridge Chapter.

7:00 p.m. Banquet.

8:00 p.m. European Versus American Fabrication Techniques, by National President A. O. Schaefer.

Wednesday, May 9

1:00 p.m. Introduction to Titanium, by B. W. Boisvert, Jacksonville Chapter.

1:45 p.m. European Melting and Foundry Practice, by C. K. Donoho, Birmingham Chapter.

2:30 p.m. Nondestructive Inspection of Materials for Nuclear Reactors, by R. B. Oliver, Oak Ridge Chapter.

3:15 p.m. Tomorrow's Aircraft, by F. N. Dickerman, Atlanta.

Speakers Define Automation at Canton-Massillon

Speakers: F. S. McCullough
T. P. Goslin
Bell Aircraft Corp.

Frank S. McCullough, manager, and Thomas P. Goslin, chief engineer, Commercial Products Division, Bell Aircraft Corp., were the speakers at a meeting of the **Canton-Massillon Chapter.** The two men spoke before 72 members and guests on the subject "Automation in Industry".

The basic reason for striving for progress is to produce the best product at the lowest cost in sufficient quantity to be profitable. Tools increase man's efficiency and automatic moving of material frees the worker to do more functions requiring decision and skill. Instrumentation makes possible manufacturing functions which occur rapidly and require an extremely high degree of skill. Instrumentation, by removing guesswork, allows lesser skilled personnel to accomplish otherwise impossible tasks. Mechanization, doing the actual work and modifying the product, brings about the product's manufacture.

Scientific progress stimulated by military emergencies is supplying us with new techniques and principles. Computers are an example and have found important applications in industry. In addition, innumerable new principles and pieces of equipment have industrial uses. A programmer, the equivalent of a dispatcher in railroading, keeps the product moving and insures all machines are loaded properly. Self supervision of the product insures quality. All these working together are needed if the goal of production men, automation, is to be realized.

The goal of automation is to provide a process where the raw material is figuratively placed in a machine and comes out as a finished product. Here all the operator does is to stand watch on the machine—he does not work on the product.

Experience in many companies has been that unemployment, the bogeyman to many when thinking about automation, has not been encountered—actually, certain job classifications have been increased. The anticipated population requirements of the United States by 1976 will produce drastic shortages of today's production rates. The answer is, of course, automation.

Savings in safety, floor space, quality improvement, and increased production—leaving alone manpower reduction—more than pay the high cost of installation, and they make possible continued competition.

Processes involving liquids only have been accomplished automatically in progressive industries for years. However, industries handling solids have lagged in the application of automation because their problems are more difficult and numerous and the solutions more costly. Weight of a material or materials inevitably enters into the problem.

Although material handling improvements have aided the century-old beam balance, it is not completely satisfactory, due often to its slowness and lack of suitable protection.

Sampling, used extensively in the food industry, is one method being used to overcome the disadvantages of the balance scale.

In the search for high-speed substitutes for the beam balance scales, electronics was naturally considered. Electronic equipment measuring the spring's natural frequency is used to speed weighing measurements.

Using the advantages of continuous proportioning, the Commercial Products Division at Bell Aircraft produced a system for weighing loose, dry materials, by basing their weighing theory on measurement of belt speed and belt loading. Belt speed measurement is accomplished with an electrical tachometer. An electrical signal, proportional to the load on the conveyor belt, is produced by a differential transformer coupled to a conveyor idler mounted on Ni-Span-C springs. This alloy makes the design of high-accuracy spring weighing systems possible. Multiplication of the two variables combined with integration of the rate signal presents the product digitally in pounds or tons.

This system is more sensitive to small weights than the beam balance scales because of the smaller force needed to drive the electronic sensing device. Accurate measurements of rapidly changing loads, smallness, lightness, low maintenance and low installation costs are other advantages of this computer.—**Reported by Edmund S. Rider for Canton-Massillon Chapter.**

Speaks at Indiana School

Richard E. Grace, assistant professor of metallurgical engineering, Purdue University, spoke to Jefferson High School students of Lafayette, Ind., on "Careers in Metallurgical Engineering". About 200 upperclass students attended the morning program. Local A.S.M. representatives who assisted on the program included: A. L. Hurst, Aluminum Co. of America; H. J. Bates, Fairfield Manufacturing Co.; and G. A. Goepfert, Ross Gear and Tool Co., all of Lafayette, Ind.

Oregon Holds Sustaining Members Night

Shown Are Representatives of Sustaining Members of Oregon Chapter Who Were Honored at a Meeting During Which National President A. O. Schaefer, Director of Research, Midvale-Heppenstall Co., Spoke on "Application of Emergency Metallurgy to Peacetime Work". (Photograph by Rollie Gabel for Oregon)

Details Causes of Metal Failures

Gerald Van Duzee (Left), Sikorsky Aircraft Division, United Aircraft Corp., Spoke on "Causes and Prevention of Failures in Metal Parts" at a Meeting Held in Indianapolis. He is shown with Edwin E. Tuttle, chapter secretary

Speaker: Gerald Van Duzee

United Aircraft Corp.

Gerald Van Duzee, senior materials engineer for the Sikorsky Aircraft Division of United Aircraft Corp., presented a talk entitled "Causes and Prevention of Failures in Metal Parts" in **Indianapolis.**

Mr. Van Duzee pointed out that helicopters are good representatives of fatigue. Sikorsky is very much interested in everything that raises or lowers fatigue strength. He stated that the tensile strength of material goes up with hardness. Big notches lower fatigue strength. Defects as notches include such imperfections as heat treat cracks, grinding cracks, nonmetallic inclusions, grinding burns, decarburization, oxide skin, forging laps, seams and retained austenite. These defects can be detected by Magnaflux, etching, anodizing, X-ray, tensile tests, microhardness tests, Rockwell and Brinell hardness tests, spectrograph and Zyglo.

To eliminate such defects it is important to train inspectors to recognize them when they see them, to educate continually, to accept affidavits from vendors only when vendor is well known, to control grinding to prevent cracks, to design carefully so there will be no stress raisers, never to relax inspection methods and to control inspection, process and materials.

Plating presents the problem of embrittlement. Embrittlement troubles can be lessened if parts are baked immediately after plating, especially high hardness material, for 3 to 5 hr. at 375 to 400° F.—**Reported by Dorothy Holbrook for Indianapolis Chapter.**

Describes Nondestructive Testing of Aircraft at Long Island Joint Meeting

Speaker: Bill Hitt

Douglas Aircraft Corp.

Members of the **Long Island Chapter** and the New York Section of the Society for Nondestructive Testing heard a talk on the "Role of Nondestructive Testing in the Aircraft Industry" by Bill Hitt, Douglas Aircraft Corp. and president, Ultrasonic Testing and Research Laboratory.

The speaker first presented a 20-min. film on nondestructive testing of aircraft components for safety in flight. He continued by giving a complete description of five years of the development of techniques to improve safety of aircraft, illustrating his talk with slides. The complete spectrum of nondestructive testing, including sonic and ultrasonic flaw detection and thickness measurement, fluoroscopy, magnetic particle inspection, fluorescent penetrant inspection and X-radiography, was described.

A tank, measuring 45 by 14 ft., and containing remote control and televiewing apparatus for testing large plate and extrusions using water submerged ultrasonic techniques, was illustrated and discussed. Various crystals and their application, operation and limiting factors were described. According to the speaker, ultrasonics is developing into one of the most useful tools to man, encompassing, among other things, use in dental therapy, medicine, deburring and cleaning.—**Reported by H. J. Corigliano for Long Island.**

Future Progress Theme At West Michigan Chapter

Speaker: Allen G. Gray

Steel Magazine

At a meeting of the **West Michigan Chapter,** Allen G. Gray, technical editor, *Steel* magazine, presented a discussion on "Metallurgical Progress".

Since World War II there has been a tremendous expansion in basic metals production capacity. This has been accomplished by plant additions, by original producing companies and by the entrance of additional companies into the basic metals field.

Dr. Gray pointed out that further expansion is necessary because population trends are upward, family formations are on the increase, and standards of living continue to rise.

It is estimated that during the next 10 years the demand for goods will increase by 40%. During this period the working population should increase by 15%. To meet this enlarged demand it will be necessary to increase the productivity of our labors. Automation is a means by which productivity can be increased.

It will be the metallurgists' increasing responsibility to work hand-in-hand with the developers of metalworking methods to improve the economics of metal selection and metal processing. New alloys must and will be developed. The work-a-day alloys of the future will resemble a tossed salad in that they will be made up of a combination of numerous alloying materials in order to develop optimum properties.

Dr. Gray illustrated his talk with demonstrations and lantern slides.—**Reported by R. F. Haskins for West Michigan Chapter.**

Denver Members Guests of A.S.M.E. for Tool Exhibit

Members of the **Rocky Mountain Chapter** were guests of the A.S.M.E. in Denver recently to hear C. G. Schelly, managing director of the Wilkie Foundation, present a lecture entitled "Civilization Through Tools". The talk correlated the rise of civilization with development of the tools which permitted the human race to satisfy its needs with increasing efficiency and productivity and with decreasing effort.

An authentic exhibit of implements, covering a span of over 500,000 years, was used to demonstrate the progressive steps of new and improved designs and materials in the history of tools.

At the conclusion of the talk, Mr. Schelly answered questions relating to his topic. The lecture and exhibit were created by the Wilkie Foundation and presented by the DoAll Co. —**Reported by F. C. Perkins for Rocky Mountain Chapter.**

IMPORTANT MEETINGS *for June*

June 3-8—Society of Automotive Engineers Inc. Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. (J. A. C. Warner, Secretary, S.A.E., 29 W. 39th St., New York 18, N. Y.)

June 4—Special Libraries Association. Annual conference. Metals Division Meeting. Hotel William Penn, Pittsburgh. (Miss G. D. Anderson, Metals Div., SLA, c/o Pittsburgh Consolidation Coal Co., Library, Pa.)

June 5-8—Material Handling Institute Inc., Exposition, Public Auditorium, Cleveland. (R. Kennedy Hanson, Managing Director, M.H.I., 1 Gateway Center, Pittsburgh 22)

June 6-8—American Society for Quality Control. Annual Meeting, Palais du Commerce, Montreal. (C. E. Fisher, Secretary, A.S.Q.C., 50 Church St., New York 7, N. Y.)

June 11-12—Malleable Founders Society. Annual Meeting, Homestead, Hot Springs, Va. (L. D. Ryan, Secretary, M.F.S., 1800 Union Commerce Bldg., Cleveland 14, Ohio)

June 17-21—American Electroplaters Society. Annual Meeting, Hotel Statler, Washington. (P. O. Kovatis, Secretary, A.E.S., 445 Broad St., Newark, N. J.)

June 17-21—American Society of Mechanical Engineers. Semi-Annual Meeting, Hotel Statler, Cleveland. (C. E. Davies, Secretary, A.S.M.E., 29 W. 39th St., New York 18, N. Y.)

June 17-22—American Society for Testing Materials. Annual Meeting and Apparatus Exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J. (Robert J. Painter, Executive Secretary, A.S.T.M., 1916 Race St., Philadelphia 3, Pa.)

June 24-26—Alloy Casting Institute. Annual Meeting, Homestead, Hot Springs, Va. (E. A. Schoefer, Executive Vice-President, A.C.I., 32 Third Ave., Mineola, N. Y.)

June 24-27—Drop Forging Association. Annual Meeting, Homestead, Hot Springs, Va. (E. L. Harden, Executive Vice-President, D.F.A., 419 S. Walnut St., Lansing, Mich.)

June 25-29—American Institute of Electrical Engineers. Combined Summer and Pacific General Meeting, Fairmont Hotel, San Francisco. (N. S. Hibshman, Secretary, A.I.E.E., 33 W. 39th St., New York 18, N. Y.)

As an indication of the tremendous dissemination of engineering information a compilation shows that in one year the ⓢ collected, edited, published and distributed over ***one hundred million pages*** **of metallurgical information.**

New Orleans Educational Lecturer

New Orleans Chapter Members Heard Three Lectures on the "Selection of Metals" During the Recent Series of Educational Lectures Presented by A. W. MacLaren, U. S. Steel Corp., Joseph Cartullo, Standard Brass Co., and J. R. Richards, Crucible Steel Co. Mr. Cartullo is shown above

"Selection of Metals" was the topic discussed in three separate lectures held by the **New Orleans Chapter** during its annual educational series.

A. W. MacLaren, U. S. Steel Corp., in a talk on the "Selection of Ferrous Alloys", discussed the application of each selection and presented the reasons for having selected each metal.

The second topic, "Selection of Nonferrous Alloys", was discussed by Joseph Cartullo, Standard Brass Co. He went over the problem of corrosion and the selection of the best nonferrous alloy for the application intended.

John R. Richards, Crucible Steel Co. of America, presented a lecture on the "Selection of Toolsteels". Of all the steps to be taken in the selection of a good toolsteel, Mr. Richards emphasized that a tool is worth no more than its scrap value, until it is heat treated correctly, regardless of the amount of money, time and effort put into it.—**Reported by Sherman E. Faught, Jr., for New Orleans Chapter.**

Receives Student Award at Columbus

Mars G. Fontana (Right), Head, Department of Metallurgy, Ohio State University, Presents a Student Scholarship Award to Harry David Roth, Sophomore Student at O.S.U., During a Recent Meeting held by Columbus Chapter. (Reported by R. E. Christin; photograph by Ohio State University)

Discusses Alloy Fabricating Properties

Hiram Brown, Solar Aircraft Co., Discussed "Fabricating Properties of High-Temperature Alloys" at a Meeting in Pittsburgh. Shown are, from left: W. J. Mayer-Oakes, Carnegie Institute of Technology; T. I. McClintock, Aluminum Co. of America, Chapter Chairman; and Mr. Brown

Speaker: Hiram Brown
Solar Aircraft Co.

The **Pittsburgh Chapter** observed Past Chairmen's Night with a talk on the "Fabricating Properties of High-Temperature Alloys" by Hiram Brown, chief metallurgist, Solar Aircraft Co.

Mr. Brown discussed the subject from the standpoint of a customer who purchases mill products and fabricates them further by such methods as forming and welding. The lecture was well illustrated with slides to show some of the problems which are encountered and the solutions which are obtained by cooperation between the mills and the customer.

The alloys under discussion were termed "super alloys" by Mr. Brown. This term covers a wide range of stainless steels as well as other alloys containing large proportions of chromium, nickel, cobalt, molybdenum and tungsten. These materials are used for their high resistance to heat and corrosion, but this very suitability for high-temperature use often causes fabrication difficulties. For example, the refractory oxides which are characteristic of these alloys can keep blisters or laminations from healing during the rolling of sheet. Inspection of the sheet will disclose many of these defects and they may come to light only after forming or welding. The oxide which can be heavy and difficult to remove may leave a rough scale pattern after descaling. This will cause trouble if the irregularities are great enough to interfere with electrode contact during resistance welding.

Grain-size effects were described as being very important in many cases. The tendency of some of these alloys to develop large grains during annealing can lead to orange peel during forming. Grain size also has a marked effect on ductility at elevated temperatures with fine-grained material being more ductile than coarse-grained material at temperatures above 1100° F. Very fine-grained materials, however, are prone to localized grain growth under certain critical combinations of stresses and temperatures.

The continuous carbide networks around grain boundaries which sometimes occur in alloys such as Type 310 stainless lead to accelerated attack under certain corrosion conditions. To control this condition, a carbide precipitation chart is used for acceptance tests. This chart is made of micrographs of various degrees of precipitation at the grain boundaries. The degrees of precipitation have been correlated with the behavior of this type of material. It was reported that this microscopic control is more effective than tensile tests, Erichsen cup or hardness tests.

Some examples of difficulties caused by carelessness in handling of materials were cited. Care must be taken to avoid carbon pickup from pencil marks, lubricants and improperly burning oxy-acetylene torches. Zinc contamination from contact with zinc tags, galvanized tote boxes, and Kirksite dies must be avoided or precautions taken to remove zinc prior to heat treating.

Mr. Brown's talk included a description of his "ring and ding" test for the rapid detection of severe carbide precipitation. **—Reported by J. P. Lyle for Pittsburgh.**

A.S.M. Officers Visit British Columbia

President A. O. Schaefer, (Left), Director of Research, Midvale-Heppenstall Co., and National Secretary W. H. Eisenman, Were Guests of the British Columbia Chapter at the National Officers Night Meeting. Mr. Schaefer delivered a talk entitled "Application of Emergency Metallurgy to Peacetime Work", and presented the Chapter's Student Award Scholarship to David John Huntly (center), this year's winner. Mr. Eisenman gave an account of the Joint Metallurgical Societies Meeting in Europe and a talk on the affairs of the Society. Chapter Chairman J. Stokes is shown at the right

Pittsburgh Chapter Honors Past Chairmen

Past Chairmen Who Were Honored at a Recent Meeting Held by the Pittsburgh Chapter Included, Front Row, From Left: Howard Scott, E. H. Dix, L. C. Whitney, and Lou Oswald. In back row, from left, are: Max Lightner, Porter Wray, A. B. Wilder, G. H. Enzian and G. A. Roberts, past national president A.S.M.

Explains Electron-Optic Techniques at Buffalo

Speaker: I. I. Bessen

North American Philips Co., Inc.

The impact of research in the field of electron-optic techniques is now being felt in metallurgical research and should continue to furnish the metals researcher with new tools for some time to come.

Three techniques—electron microscopy, electron diffraction and emission microscopy—have markedly influenced and broadened the scope of metallurgical investigations over the past few years. Their basic principles and applications were explained at a meeting of the **Buffalo Chapter** by Irwin I. Bessen, a physicist at the North American Philips Co., Inc., in a talk entitled "Electron-Optic Techniques Applied to Metallurgy".

Electron microscopy, applied to metals, requires more elaborate preparation of specimens than when used in other fields of research. Replicas must be made of the surface because the metal sample itself will not transmit electrons.

There are four major steps in specimen preparation for electron micrographs—polishing, etching, replication and shadowing. Polishing and etching are done in a manner similar to conventional metallographic work, except that certain etchants have proved superior for electron micrography. Two of the most popular solutions are 4% picral and 2% nital. Proper depth of etching is important for it affects the resolution of micrographs.

Replication techniques are many and varied but generally can be classified as separated oxide films, positive replicas or negative replicas. Negative replicas are among the most widely used.

Replicas are shadowed to give a three-dimensional effect to micrographs. This is done by evaporating a thin layer of dense metal onto the replica surface from an angle.

Electron microscopes have a one-meter depth of focus and high resolving power has been their greatest advantage over conventional light microscopes.

A recent development in the field of electron diffraction allows the metallographer to make a diffraction pattern from any particular extracted particle in a structure which is observed in the electron microscope. Thus, crystallographic identification is possible without having to resort to separate measurements.

Thermionic emission microscopy is used to study changes in metal structures at elevated temperatures. Useful magnifications are the same as those of light microscopes and resolution is 100 to 1000 A. The specimen surface is coated with an activator, which causes emission of electrons at a low energy level.

Mr. Bessen showed a series of excellent motion pictures of metallurgical transformations taken through the emission microscope.—**Reported by A. E. Leach for Buffalo.**

OBITUARIES

A. ORAM FULTON, who was 70 years of age, died late in February. At the time of his death he was chairman of the board and treasurer of Wheelock, Lovejoy & Co., Inc., with which company he has been associated for 46 years. He was graduated from Lehigh University in 1908 and joined Wheelock, Lovejoy & Co. in 1910 as a salesman. He became vice-president in 1919, president and treasurer in 1924 and chairman of the board and treasurer in 1949.

During World War II he served as chief of the Alloy Unit of the Iron and Steel Division of the War Production Board. He is survived by his wife, three children and nine grandchildren. Mr. Fulton was National Treasurer A.S.M. in 1930. He was a member of the Boston Chapter.

♦ ♦ ♦

ALFRED D. BEEKEN, SR., vice-president sales, Vulcan Crucible Steel Division H. K. Porter Co., Inc., died unexpectedly at his home in Beaver, Pa., late in March. Mr. Beeken had been associated with Vulcan since his graduation from Carnegie Institute of Technology in 1914. He was a past chairman of the Pittsburgh Chapter.

Meet Your Chapter Chairman

LONG ISLAND

HERBERT S. KALISH, engineering manager, Atomic Energy Division, Sylvania Electric Products Inc., was born in New York City. He attended Brooklyn Technical High School and Case Institute of Technology, and holds a B.S. degree in metallurgical engineering from Missouri School of Mines and Metallurgy, M.S. degree from University of Pennsylvania and Ph.D. from Missouri School of Mines. He was active in track at college.

Herb's first job was as a metallurgical observer at the Gary Works of Carnegie Steel Corp. Other jobs were as a research engineer at Battelle Memorial Institute and research engineer at Electric Storage Battery Co. Since 1948 he has been associated with Sylvania.

Herb has a two-year old son. He likes photography, swimming and ice skating, and his membership in technical organizations and office with the Long Island Chapter keeps him busy. He served in the European Theatre with the Field Artillery as a survey sergeant during the war. He has had several articles published in A.S.M. and A.I.M.E. *Transactions* and in other journals.

WEST MICHIGAN

ROBERT L. SWEET was born in Waupun, Wis., and attended elementary and high school in Milwaukee. He obtained his B.S. degree from Marquette University, his M.S. from University of Michigan and his Ph.D. from Michigan State. At Marquette he participated in track and boxing. After graduation he worked in the sheet metal division at Nash Body and later was project engineer for the ferrous physical metallurgy development department. Since 1937 he has been associated with Michigan State in various teaching capacities, being professor of metallurgical engineering at present.

Bob is married and has three children. He has served on the executive committee of the Detroit Section A.I.M.E. and as president of the Michigan State Section A.S.E.E. He has taken a keen interest in metallurgical education as evidenced by his service for the Detroit Chapter A.S.M. and later as chairman of the West Michigan Chapter's education committee. He is presently on the National Advisory Committee on Metallurgical Education and chairman, Group II Howe Medal Award Committee. From 1951 to 1953 he served on the Handbook Committee.

Bob is an avid hunter and fisherman of long standing. A good golfer, he has been unable to play as much as he would like. According to Mrs. Sweet, his social bridge game has improved greatly of late, due probably to the bridge he plays with his faculty associates during lunch hour.

LOS ANGELES

ROY E. PAINE, works chief metallurgist, Vernon Works, Aluminum Co. of America, was born in San Francisco, where he attended public schools. He received his metallurgical engineering degree from Stanford University. Roy made his first castings at the age of 13 and has been associated with foundry problems much of the time during the past 35 years. He worked four years as a research metallurgist with the Aluminum Co. of America's Research Laboratories in Cleveland, Ohio, and since 1935 has been associated with the California operations of Alcoa.

Roy is a member of several technical and civic organizations. He has served the Cleveland, Golden Gate and Los Angeles Chapters A.S.M. in various capacities over the years and has spoken before several West Coast chapters since 1929.

Golf, photography and conservation of wilderness areas are Roy's principal interests. He is married and has no children.

PHILADELPHIA

JOHN P. CLARK, JR., owner of the John P. Clark Co., was born in Allentown, Pa. He received his B.S. in chemistry from St. Joseph's College in Philadelphia and did post-graduate work at Temple and Penn State. He was active in football and track at school. He did various types of work after leaving school and has been a sales engineer for 20 years.

John has seven children, ages 2 to 13 years, four boys and three girls. He is active in Rotary, Kiwanis and Boy Scouts of America, and is also active in civic and church affairs. He was secretary of the Philadelphia Chapter A.S.T.E. and has served his chapter A.S.M. in many various capacities. Hunting, baseball, golf, fishing and the Boy Scouts are John's principal outside interests. His company is a sustaining member of the Philadelphia and the Carolinas Chapters A.S.M.

BALTIMORE

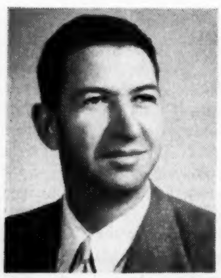
ERITH T. CLAYTON was born in Johannesburg, Union of South Africa. He attended Jeppe high school and Victoria University, Manchester, England. He was interested in track and rifle shooting while at school. His first job was in northern Idaho at Silver King in the plant of the Bunker Hill and Sullivan Electrolytic Zinc Works, where he held various positions, after which he had charge of pilot and test plant for Electrolytic Zinc in East St. Louis. He also worked at the Sparrows Point plant of Bethlehem Steel Co. He is presently president of the Tainton Co., a research and development group, and vice-president of Peen Plate, Inc., a company commercializing a new electroless method of plating using mechanical energy.

Mr. Clayton is married but has no children. He is a member of National Association of Corrosion Engineers. Fishing, swimming, sailing and water sports are attractive to him. During the war he served in a civilian capacity on a project for upgrading tin concentrates in the Bolivian Andes.

JACKSONVILLE

JOE F. CAMPBELL, production engineer, Grant Manufacturing Co., was born in Florence, S. C., and graduated in 1938 from the University of South Carolina with a B.S. degree in civil engineering. His first job was as an engineer in the bridge department for the South Carolina Highway Commission.

Joe has two boys, Craig, 10, and Bradley, 8. He is a 32nd degree Mason, and enjoys all sports, especially water skiing and hot rod racing. He served in the U. S. Treasury, Bureau of Federal Supply from 1941 through 1947.


H. S. Kalish


R. L. Sweet


J. P. Clark, Jr.


E. T. Clayton


R. E. Paine

Rocky Mountain Hears Talk on Better Metal Quality Through Forging

Speaker: E. O. Dixon
Ladish Co.

E. O. Dixon, vice-president in charge of research and metallurgy, Ladish Co., spoke on "Better Metal Quality Through Forging" at a meeting of the **Rocky Mountain Chapter.** His experience has covered the wide range of engineering and metallurgy which is associated with the production of closed and open die forgings, and the various special hot forming operations in connection with parts for aircraft, tractors, oil well tools, gas turbines and fittings for modern high-pressure and high-temperature piping.

Mr. Dixon pointed out that the art of forging is assumed to be at least 7000 years old, thus it is one of the oldest forms of metalworking. He discussed the history of forging and described various hammers in use today, including a double action, or two-way hammer, developed in Germany and now in use at his company.

The advantages of several types of hammers were discussed, as were some forge shop problems and needs. For example, it was pointed out that quite an elaborate layout of heat treating and laboratory facilities is necessary and desirable in order that the quality of both finished forgings and raw materials may be determined and controlled as required. Slides were shown of various types of equipment, including equipment and processes involved in ultrasonic testing. This comparatively new type of test discloses flaws that would remain hidden without its use until revealed by failure of the part.

Some of the important benefits of the forging of metals were pointed out. These include a saving in weight, a saving in the amount of machining that is necessary and improved physical properties. Slides were shown illustrating the alignment of the grain structure parallel to the contour of the part. Transverse ductility is very favorably affected by the high impact pressures and plastic deformation of forging, particularly in closed dies.

Mr. Dixon's talk was well illustrated with slides. The meeting was concluded with a question and answer period.—**Reported by V. D. Heinze for Rocky Mountain-Denver.**

Awarded A.S.M. Scholarship at Purdue

Richard J. Choulet, Sophomore Student in Metallurgical Engineering at Purdue University, Is Shown, Left, Receiving Certificate of Award of an A.S.M. Scholarship From Lester Alban, Right, Chairman of Purdue Chapter. Center is R. Schuhmann, Jr., chairman of Purdue's metallurgy division

New Welding Procedures Outlined in Jacksonville

Speaker: Harry Ward
Eutectic Welding Alloys Corp.

At a recent meeting of the **Jacksonville Chapter,** Harry Ward, Eutectic Welding Alloys Corp.'s regional manager for Florida, Cuba and the British West Indies, presented a welding demonstration, accompanied by a film, on the subject, "New Welding Procedures".

Mr. Ward discussed the tremendous advantages of low-temperature surface alloying as opposed to methods requiring the actual fission of the base metals in production and maintenance work. By film and actual demonstration he showed that many thousands of dollars may be saved each year in tool, die and machinery salvage, and that costly down-time may be greatly reduced with low-temperature alloys and methods that do not require dismantling of machinery or equipment.

Concerning production welding, Mr. Ward pointed out that low-temperature, nonfusion joining of integral parts allows greatly increased speed on assembly lines with the practical elimination of weld rejects.

As Mr. Ward stated and demonstrated, 75% of the production and maintenance jobs that could be done better, faster and at less expense by welding are being done by less satisfactory and more expensive methods. Thus, through years of research and development, low-temperature welding alloys and procedures have opened to industry a great new field of production methods and maintenance techniques.—**Reported by W. W. Stillson for Jacksonville Chapter.**

York Holds National Officers Night

"The Importance of Standards to Industry" Was the Title of the Talk Delivered by National President A. O. Schaefer, Director of Research at Midvale-Heppenstall Co., at a Meeting of the York Chapter. Shown during the meeting, from left: George E. Shubrooks, national trustee; Mr. Schaefer; and Roy Livingston, chairman. One of the highlights of the evening was the presentation of a gift to Mr. Shubrooks for his outstanding work in the Chapter, plus the fact that he is the first person from the York chapter to be elected as a national officer. A panel discussion, moderated by Mr. Schaefer, completed the evening's activities

Talks on Cold Extrusion in New Jersey

J. E. King, Heintz Manufacturing Co., Presented a Talk on "Cold Extrusion of Steel" at a Meeting of New Jersey Chapter. Shown are, from left: R. A. Grange, chairman; Mr. King; and K. B. Baker, technical chairman

Speaker: John E. King
Heintz Manufacturing Co.

John E. King, assistant to the manager of the cold forming division, Heintz Manufacturing Co., delivered a talk on the "Cold Extrusion of Steel" at a recent meeting of the **New Jersey Chapter.**

Mr. King stated that the application of the cold extrusion process to steels had its beginning in Germany about 20 years ago with the production of small arms cartridge cases utilizing low carbon steel. Extruding steel was kept a German secret until after the war. During the last 10 years, however, the lead in the development of this process has been taken in the United States. The discovery which made this process possible was the realization that a steel with a suitably prepared surface could be made to flow readily. At present the commercial method of accomplishing this objective is surface preparation by phosphate coating. Such a coating is chemically bound to the steel. Application of a suitable lubricant, usually a high-titre soap, to the treated surface permits successful use of cold extrusion.

As to the cold extrusion operation itself, Mr. King stated that both forward and backward extrusion is applicable to a suitably treated and lubricated steel blank. Many of the parts in production today require a combination of the two methods in conjunction with process anneals. Cold extrusion of steel from an economic standpoint is best adaptable to production line methods. Alloy steel and/or carbide tools are used. It has been reported that as many as 500,000 pieces have been made, using carbide tools, without appreciable wear or failure.

The principal advantages of the cold extrusion method of forming steel parts are:

1. High metal recovery (very little machining required; hence, great weight and cost savings in stock over other forming methods).
2. High mechanical properties (the high strengths together with good residual ductility often eliminate need for heat treatment subsequent to forming).
3. Close tolerances.
4. High-grade finish (from 30 to 45 micro-in.)

Mr. King concluded his talk by presenting a highly factual movie showing the Heintz Co.'s method of manufacture of the 275-mm. rocket head utilizing the cold extrusion process.—**Reported by R. W. Meyer for New Jersey Chapter.**

Presents Talk Before the Chicago-Western Group on High-Temperature Steels

Speaker: Malcolm F. Judkins
Firth Sterling Inc.

"High-Temperature Steel Applications" were discussed by Malcolm F. Judkins, Firth Sterling Inc., at a meeting of **Chicago-Western.**

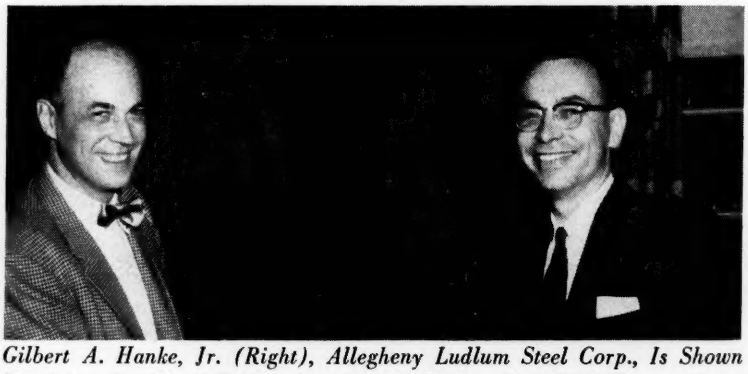
Mr. Judkins detailed the growing requirements for materials to be used in high-temperature environments and the limitation of metals because they oxidize or burn in applications such as turbines, airplanes and rockets. Rockets, for example, falling freely from a rarefied atmosphere, when re-entering the earth's atmosphere at the picked up speed, may be destroyed by aerodynamic heating.

Ceramic materials have been used because of their better resistance to high temperatures. One of the most promising ceramics is titanium carbide, which has a useful strength at temperatures of 1800° F., with a stress rupture of 300 hr. at 15,000 psi. It has adequate resistance to oxidation and good thermal shock. The titanium carbide cermets, however, have no ductility (i.e., there is no necking down on failure).

The problems of vacuum melting and fabricating the higher melting point metals were discussed.

The speaker emphasized the importance of considering the service temperature properties of the metal or material rather than its room temperature properties. This was graphically illustrated by comparing the hardness of various materials with increasing temperature. — **Reported by A. F. Koctur for Chicago-Western Group.**

Receives Geisler Award at Eastern N.Y.



Gilbert A. Hanke, Jr. (Right), Allegheny Ludlum Steel Corp., Is Shown Receiving the Alfred Geisler Award of the Eastern New York Chapter From Walter Hibbard, Chairman, During a Recent Meeting. The Geisler Award was originated by the Chapter as a memorial to the late Dr. Alfred Geisler of General Electric Research Laboratories. It is bestowed each year upon some chapter member under 35 years of age who has made an outstanding contribution to nearly any phase of the metals industry. Mr. Hanke, this year's recipient, received the award for his work in the extrusion of stainless and alloy steels. (Reported by Nicholas E. Doyle, Jr.)

Speaks in Philadelphia On Cold Extrusion Process

Speaker: Harold P. Babcock

Frankford Arsenal

At a meeting of the **Philadelphia Chapter,** a lecture on "Cold Extrusion" was delivered by Harold J. Babcock, chief metallurgist, Artillery Ammunition, Frankford Arsenal.

Mr. Babcock, who explained that the opinions expressed were his own and did not in any way express the official viewpoint of the Ordnance Corps, explained that the cold extrusion of steel is a new application of an old principle, made possible by technological advancement in lubrication and die steels. The flow of metal from a closed container under pressure out through a die had its origin over one and a half centuries ago. Until only recently, however, only nonferrous metals were formed in this way. Lead and tin were (and still are) cold extruded readily into collapsible tubes and a variety of other cylindrical shapes by the indirect or impact process. Copper and brass are commonly extruded by the "Hooker" or direct extrusion process. In this process, the metal is initially in the form of a cup or shell or cylindrical slug instead of the usual flat blank. Less pressure is required by the direct or forward extrusion process than in other types and the big advantage rests in the shorter stroke combined with a long extruded length.

Commercial activity began on the cold extrusion of steel during the first World War. Since that time, improvement in equipment, and particularly lubrication practices, has made possible cold extrusion of steel with up to 45 points of carbon. The tools and dies used in cold extrusion require a combination of toughness, high hardness and good wear resistance. High speed steels and carbide tipped tools are just a few of the materials employed to meet these property requirements under extreme load and continued production.

A large variety of intricate shapes are possible by a combination of backward and forward extrusion. In the manufacture of a shell from a steel slug by cold extrusion, the base portion of the shell is produced by cold working to the required stress level by backward extrusion, and forward extrusion is used to elongate the remainder of the shell to its final size, after which the shell is cold nosed. The steel is usually not spheroidized when it first enters the die, but cold work accompanied by process annealing just below the critical causes spheroidization during the cold shaping sequence.

Mr. Babcock closed his informative lecture by emphasizing that additional research and development are necessary to increase the efficiency of the cold extrusion of all types and qualities of steel. — **Reported by George Krauss for Philadelphia.**

Discusses Weld Toughness at Syracuse

From Left: Fred Hunter, Chairman; Austin Hiller, General Electric Co., Who Spoke on "Weld Toughness"; and M. D. Coughenour, Entertainment Committee Chairman, Are Shown During a Meeting Held Recently by the Syracuse Chapter. (Photograph by D. B. Blackwood for the Syracuse Chapter)

Speaker: Austin Hiller

General Electric Co.

Austin Hiller, manager, product planning and marketing research, welding department, General Electric Co., discussed the basic problem of "Weld Toughness" and how this important property affects the over-all quality of welded structures at a meeting held recently by the **Syracuse Chapter.**

One must consider the proper approach to determining the limits of strength of a material, then arrange the details of design to meet the required limits. An example of faulty design is in the laboratory duplication of the explosive fracture of welded ship structures. In too many instances, failures in laboratory models can be attributed to design faults before all service variables can be introduced and counteracted. This impasse is caused by the variable influence on service structures of notches and temperatures which are difficult to match on a laboratory scale.

Another variable which is difficult to define in service structures is the basic nature of the applied stress. This may be overcome by a study of the tendency toward slip versus the tendency toward crystal cleavage in a structural material.

Mr. Hiller pointed out that it is now known that some added elements aid slip while others obstruct it and it has been known that the influence of banding, segregation and inclusions on cleavage is great. Until the fundamentals are resolved, usable welded structures must be designed and built to absorb energy in amounts near the elastic limit without destruction. The weldment is tough if localized strains and stresses can be relieved by yielding. Ideally, in each service structure, maximum service stresses would be equal in all areas at all times. For the future, the gap between service failures and laboratory duplication of failures can be bridged by the determination of an actual measurable value for inherent ductility in a material. In this way, test structures will be standardized and in-service variables more easily isolated and studied.—**Reported by Louis Zakraysek for Syracuse.**

Albuquerque Members Visit New Mexico Power Station

Members of the **Albuquerque Chapter** and its student affiliate from the New Mexico Institute of Mining and Technology and guests recently visited the Person Station of the Public Service Co. of New Mexico. G. U. Greene of New Mexico Institute accompanied the student members.

The Person Station is the newest and largest steam-electric generating station of the Public Service Co., having a present capacity of 70,000 kw. and a planned future capacity of 100,000 kw.

At the present time there are two General Electric 20,000-kw. units and one Westinghouse 30,000-kw. unit installed in the plant. The visiting group was fortunate in that the Westinghouse unit was dissassembled for a routine inspection after completion of one year of service. A close inspection of the component parts of the turbine was therefore possible and the erosion and pitting effects of high-pressure steam on turbine materials could be observed.

The Person Station is a part of the New Mexico-West Texas Power Pool, which includes the El Paso Electric Co., U. S. Bureau of Reclamation, Community Public Service and the Public Service Co. of New Mexico.—**Reported by C. E. Arthur for Albuquerque.**

N. W. Pennsylvania Tours Forge Plant

Members of the Northwestern Pennsylvania Chapter Are Shown During Their Recent Tour Through the Erie Forge & Steel Corp. Purpose of the tour was to acquaint the metallurgists with the modern precision methods and facilities used at the plant in the production of a wide variety of steel forgings and castings, ranging in weight from 10 to 165,000 lb.

Over 100 members of the **Northwestern Pennsylvania Chapter** visited the Erie Forge & Steel Corp. recently. They were received and welcomed by Harold Myers, plant manager, who presented a history of steelmaking in Erie.

Mr. Myers informed the group that the company operates two works, the East and the West, in Erie. At the East Works, large ingots are cast from three large acid openhearth furnaces, as well as large castings, up to 300,000 to 400,000 lb. The plant is currently making rim steel for the automotive and structural plate industry. He also described the forging shop, which turns out single-piece forgings for the electrical industry, and forgings for steel mills and ship shafting. A large assortment of crankshafts are also made at the plant.

Mr. Myers turned the group over to the plant metallurgist, George E. Danner, who took it through the openhearth, forge shop, heat treat, welding and machining facilities at West Works. After the two-hour tour, the group was served refreshments and took a tour of the main office building.—**Reported by George E. Danner for Northwestern Pennsylvania Chapter.**

Metallurgy of Cast Iron Is Described at Peoria Meeting

Speaker: F. T. McGuire

Deere & Co.

Members of the **Peoria Chapter** recently heard a very interesting talk on "Metallurgy of Cast Iron" by F. T. McGuire, manager, materials engineering department, Deere & Co. Many illustrations showing the structure of cast irons, obtained by different cooling rates, composition and various foundry practices, were shown. Mr. McGuire pointed out that the many variables of the structures of cast iron should be fully evaluated when considering cast iron test data.

Mr. McGuire emphasized correct engineering for cast iron applications. He noted that too many engineers consider cast iron as a chunk of metal. This should be corrected. The engineer should design parts so that the many desirable properties of cast iron might be fully utilized.—**Reported by James M. Warfield for Peoria Chapter.**

Describes Hot Extrusion Of Stainless Steels at Indianapolis Meeting

Speaker: A. G. Cook

Allegheny Ludlum Steel Corp.

A. G. Cook, Allegheny Ludlum Steel Corp., presented a talk on the "Hot Extrusion of Stainless Steel" at a meeting of **Indianapolis Chapter.**

Extrusion was defined as the shaping of metal into continuous form by forcing it through a die of appropriate shape. The extrusion of metals is an old process, the first work being done in the late 1700's on nonferrous metals. Most of the early development work was done by the English.

The problems associated with the high temperatures and pressures required hampered the development of the extrusion of steels. The Ugine-Sejournet patents covering the extrusion of steels by use of glass opened up a new field in the extrusion of metals. Allegheny Ludlum, licensed under these patents, built a completely new extrusion department at Watervliet, N. Y., equipping this plant with a 1500-ton extrusion press.

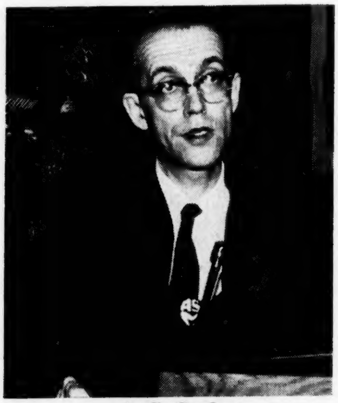
The billets are heated in a salt bath, transferred to the extrusion press, rolled in glass, charged into the extrusion press and extruded. Both solid shape extrusions and tubular shell extrusions are produced on this press.

The dies used in the extrusion of steel are removed from the press after each extrusion, cleaned and returned for a subsequent cycle.

The surface condition of the billets prior to extrusion is reflected in the surface of the extruded product. In general, the smoother the billet surface after turning, the better the extruded product surface will be.

The glass is used in this process both as a lubricant and as an insulator. A number of different kinds of glasses are used, and the particular glass used on an extrusion depends upon the properties of that glass, such as viscosity, being matched to the requirements for that particular extrusion.

Mr. Cook stated that there were several reasons for considering the extrusion process for the production of solid shapes of stainless and alloy steels:



A. G. Cook

1. The ability of the extrusion process to produce shapes which are not considered rollable by reason of their unbalanced section or intricate shape.
2. The flexibility of the extrusion process, which permits the changing from one shape extrusion to another shape extrusion in a very short time enables the extrusion process to produce small quantities of shape extrusions where the rolling charges would be prohibitive.
3. The extrusion process can, in certain circumstances, permit the use of alloys which do not lend themselves to rolling but which are extrudable.

Ferrous extrusions are new products on an expanding market and offer many possibilities for the design engineer.—**Reported by Dorothy Holbrook for Indianapolis.**

Metallurgy of Fast Heating Topic at St. Louis Meeting

Speaker: Charles A. Turner, Jr.
Selas Corp. of America

Members of the **St. Louis Chapter** heard Charles A. Turner, Jr. metallurgist, Selas Corp. of America, speak on "Metallurgical Aspects of Fast Heating".

Mr. Turner began by pointing out that the highly competitive nature of modern business and the return of the buyer's market have forced management to place increasing emphasis on cost reduction as a major goal for successful operation. This trend has finally caught up with the heat treating departments, so that today faster heat processing has provided important economies, with no sacrifice in product quality.

Mr. Turner directed his attention to fast heating as developed by the combustion of air and gas in special ceramic burners, with temperatures to 3000° F. For localized heating, such as strip, he said, we are speaking in seconds, for billets and bars, in minutes, and for large shapes such as ingots, rolls and blocks, in terms of hours. For fast heating, the heat source is compacted and patterned so that the workpiece is completely surrounded by the high-temperature medium. In addition, the element of precise control is provided which results in a uniformity of heat effect on successive pieces handled singly or in a continuous production line.

He referred to an application of fast heating involving heat treatment of die blocks ranging from 8 to 24 in. thick, with a typical analysis of 0.50 C, 0.85 Cr, and 0.40 Mo. Established practice employed heating rates of 100° to 150° F. per hr. and soaking times of about ½ hr. per in. of average cross-section, accounting for time cycles of 20 to 30 hr. Rapid heating cycles for this treatment were established which permitted an increase in production of 4 to 5 times more heated steel than is possible from the conventional furnace.

Mr. Turner pointed to heating of steel rolls for hardening as another critical operation where rapid heating offers advantages. For, while conventional heat treating was accomplished in an 18-hr. cycle, in one instance, fast heating took only 95 min. Moreover, a uniform quench resulted, achieved by elimination of detrimental scaling.

He indicated that the heating of ingots for rolling has also received considerable attention and rapid heating of bars and billets for hot working has, in the last decade, established a fine performance record in many varied applications. Mill installations of high-speed gas heating furnaces for hot working are proving that steel heated rapidly, with no soak, exhibits improved metal flow beyond that of steel heated slowly, and soaked. This improved forgeability reduces power requirements at the usual forging temperatures. More importantly, this increased capacity for hot work can be used advantageously to permit working the steel at lower temperatures.

The influence of scale in increasing surface friction and decreasing die life is well known to the forging industry and all efforts are made to avoid its formation or to effect its removal before the hot piece is placed on the dies. Fast heating, in addition to reducing scale formation, minimizes, or eliminates, the occurrence of subsurface oxides which, if present, increase surface friction, and thereby increase resistance to deformation, and reduce die life.

Fast heating often accounts for a unique combination of mechanical properties, developing an improved yield strength and ductility, as measured by percentage elongation, with no increase in tensile strength or hardness, stated the speaker. He noted the application of fast heating to the production of casing with a minimum yield strength of 110,000 psi., which permitted the drilling of deeper wells to 20,000 ft. and beyond. This high yield was developed by fast tempering to temperatures in the range 1200 to 1250° F., which resulted in a substantial degree of toughening.

Mr. Turner observed that the Ordnance departments of the Army and the Navy are looking favorably upon short-cycle processing in the heat treatment of artillery projectiles, and that an expansion in such application is anticipated. The advantages of this fast heating, he said, lie in the compactness of the equipment, simplicity of automatic, continuous operation and the uniformity of properties developed in pieces produced in high production quantities. For a critical product such as artillery projectiles, the potential offered by such processing is readily apparent. Cold extrusion, presently applied to large-scale production of ammunition components, but geared for application to a variety of commercial products, is utilizing fast heating to permit placement of the annealing operation into the production line.

Gas-air flame hardening, applied to numerous components, such as gears, pinions, rollers, shafts, railroad rail ends, cams and wheels, was said by Mr. Turner to have proved to be the most economical production method for developing greater strength and longer life for critical service.

He cautioned that fast heating cannot be indiscriminately applied, but requires a thorough preliminary analysis of the many factors involved. In many cases, laboratory development work is required to determine that the approach is metallurgically sound. The increasing acceptance of the fast heating method by industry verifies the potential benefits of reproducibility, ease of control, reduced costs, rapid production and improved product quality.

Mr. Turner demonstrated his talk with over 40 color slides. A lively question and answer program followed his speech.—**Reported by Robert D. Leslie for St. Louis.**

Chromium Is Topic at Western Ontario

J. Guffie, Manager, Metal and Thermite, United Chromium of Canada Ltd., Talked on "Chromium—the Putting-On Tool of Industry" at a Recent Meeting Held by Western Ontario Chapter. Mr. Guffie showed that electrodeposited chromium has a definite place in industry and that the characteristics of the metal should be known before its application. Present were, from left: B. J. Blair, technical chairman of the meeting; Mr. Guffie; and E. F. Howard, Proto Tools of Canada Ltd. (Reported by F. Miller)

Metallurgical News and Developments

Devoted to News in the Metals Field of Special Interest to Students and Others

A Department of *Metals Review,* published by the
American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Anniversary—The 50th anniversary of the pouring of the first heat of electric melted steel in America was celebrated early in April by Crucible Steel Co. of America. The original furnace, now enshrined in a park on the grounds of Crucible's Sanderson-Halcomb Works at Syracuse, was installed and operated under the personal supervision of its inventor, French scientist, Paul Louis Toussaint Heroult.

Lab Courses—The summer laboratory course in "Techniques and Applications of the Electron Microscope" will be given from June 11 to June 23 on the campus at Cornell University this summer. The course is designed to give members an intensive survey of basic theory and interpretations of results. Registration is limited to a small group. Information from: Prof. B. M. Siegel, Dept. of Engineering Physics, Cornell University, Ithaca, N. Y.

Germans Visit—Officials of Vanadium-Alloys Steel Co. served as hosts to a visiting group of West German industrialists who viewed the operations of the toolsteel firm's Latrobe, Pa., plants. The visit was one of the stops for the German engineers who spent three weeks touring U. S. metalworking centers in the Pittsburgh area.

Symposium—Stanford Research Institute and University of California will jointly sponsor a three-day symposium on "Methods, Materials and Processes Involved in the Uses of High Temperatures in Science and Industry", from June 25 through 27 at the University's Berkeley campus. Inquiries should be addressed to: N. K. Hiester, Chemical Engineering Section, Stanford Research Institute, Menlo Park, Calif.

Fellowships—The Bureau of Mines Department of the Interior has established a group of graduate fellowships in metallurgy and related fields at Carnegie Tech, to be available for the next academic year, beginning Sept. 1. Graduate students selected will do research under supervision at the Carnegie Tech Metals Research Laboratory and the Bureau's pilot plant facilities adjoining the campus. Projects selected must be of a fundamental and original nature so doctoral theses can be based on them. Theses on any phase of high-temperature metallurgy related to metal refining are currently of special interest to the selection committee. Applications should be submitted as soon as possible to the Dean of Graduate Studies, Carnegie Institute of Technology, Pittsburgh, Pa.

Drop Forging Fellowship—Establishment of a graduate fellowship in metallurgy, the first in a new program, has been announced by the Drop Forging Assoc. Carrying a stipend of $2000, this fellowship will be for the study of metallurgical aspects of closed die forgings at Michigan State University in the year 1956-57.

No Longer Rare—Metals that were considered rare a decade ago, columbium and tantalum, are now helping to make special materials resistant to high abrasion and high-temperature conditions. Now available in large quantities from Shieldalloy Corp., the metals are supplied as carbides to manufacturers of carbide parts in the form of powders especially suitable for compacting into useful shapes.

Australian Conference—The Ninth Annual Meeting and Conference of the Australian Institute of Metals is being held in Newcastle from May 21 through 25. The theme of the conference is "Surface Defects in Steel".

Manual—A 44-page handbook, "The Lorco Method of Precision Barrel Finishing for Metals and Plastics" tells how to tumble to get best results and effect maximum production savings. Simple, basic techniques, developed around a series of 27 chemical compounds, used with or without fused aluminum-oxide chips and other media, are described. Much of the material in the book is based upon original research. Brochure is being offered at 50c a copy by Lord Chemical Co., York, Pa.

Summer Courses—University of California has announced two courses to be offered this summer on the Berkeley campus. The first, "Nuclear Engineering Short Course", will run from July 2 through Aug. 31; the second, "Nuclear Engineering Survey", will run from July 9 through July 14. Information may be obtained from: K. L. Downes, Executive Secretary, Engineering Extension Nuclear Energy Programs, Room 100, Bldg. T-11, University of California, Berkeley 4, Calif.

Book Exhibit—Some 250 French scientific and technical books will be exhibited at the Engineering Societies Library, 29 West 39th St., New York City, during June. Engineers, educators, scientists and researchers are invited to browse through selected books made available by the Cultural Division of the French Embassy, N. Y. through the cooperation of the leading publishing firms in France. There will be books in all fields of science, metallurgy included.

Courses Offered—Summer courses to be offered at M.I.T. include one on "Aerodynamic Heating of Aircraft Structures in High-Speed Flight", from June 25 through July 6, and one on "Metallurgy of Iron and Steelmaking", to run from June 18 through June 29.

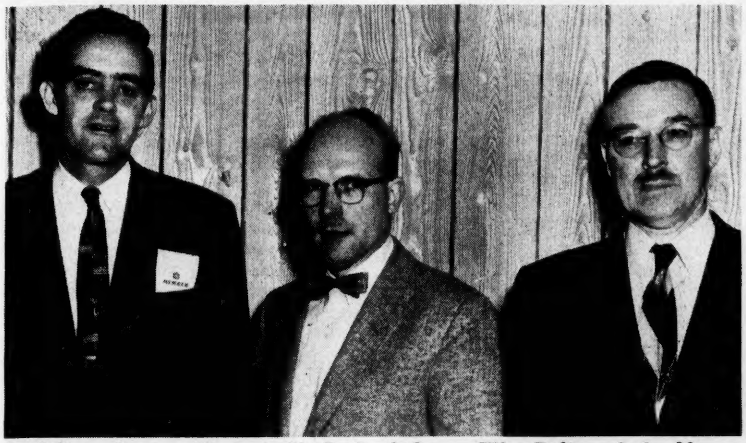
Thin Aluminum—Sheet aluminum thinner than the finest strand of spider web is being produced in the Republic Foil and Metal Mills Co., Danbury, Conn. Sheet aluminum 0.026 in. thick, is rolled down to foil of a minimum thickness of 0.00017 in. which is more than 100 times longer than the original sheet. Five General Electric speed variators assure the constant tension so important during rolling operations.

Solar Proceedings—The Association for Applied Solar Energy has announced publication of the proceedings of the World Symposium on Applied Solar Energy. Published by Stanford Research Institute, the proceedings is considered a major publication in the field. May be obtained from the Association, 204 Heard Bldg., Phoenix, Ariz. Price: $5.00.

Bond Analyzer—An ultrasonic bond analyzer manufactured by Allen B. Du Mont Laboratories, Inc., will enable airframe, missile and helicopter manufacturers to test the strength of adhesive bond materials without destruction of the unit under test.

Pinhole Spotter—A detector for spotting pinholes, which inspects sheet metal strips at a rate of 1100 ft. per min., has been announced by Linderman Engineering Co. As the metal passes under a high-frequency ultraviolet source, light that leaks through any vertical or angular pinholes registers on photo-electric cells underneath. The machine can detect holes down to 0.0003 in. in diam.

Presents Grossmann Memorial Lecture



J. Gilbert Cutton (Center), U. S. Steel Corp., Who Delivered the Marcus Grossmann Lecture Before Mahoning Valley Chapter, Is Shown With G. Welch (Left), Technical Chairman, and A. H. Vaughn (Right) Vice-Chairman

Speaker: J. G. Cutton

U. S. Steel Corp.

The Seventh Annual Marcus A. Grossmann Lecture, honoring a nationally known metallurgist from the Youngstown area, was recently held by the **Mahoning Valley Chapter.** J. Gilbert Cutton, maintenance division, U. S. Steel Corp., gave a talk entitled "Improving Service Life of Steel Mill Equipment".

Mr. Cutton pointed out the importance of continuity of operations to steel production and the growing demand for metallurgists on maintenance problems. His talk centered on several improvements made at U. S. Steel's Youngstown district. One achievement was the development of stronger and tougher cast tooth blooming-mill pinions. Pinions on the 43-in. blooming mill were changed on the average of every 5½ months, generally because of broken teeth. Metallurgical investigation disclosed pinion tooth failures were due primarily to a lack of toughness as measured by the impact test. Improved heat treatment of nickel-steel pinions, to give a well-dispersed carbide microstructure without large free ferrite areas, resulted in a threefold increase in impact strength. These high-impact strength pinions were in continuous service for 37 months, with considerably more service anticipated.

Mr. Cutton noted how the use of alloy steels has reduced the number of failures on several pieces of equipment. Also, chromium plating minimized the wear and maintenance on hydraulic plungers in such uses as the ingot stripper plunger and the openhearth furnace door plungers.

The uses of T-1 alloy steel in steel mill applications were illustrated. T-1 steel is a recently developed heat treated material with high strength, toughness and good weldability.

Mr. Cutton believes the application of metallurgy to maintenance work has and will provide a rich and rewarding field for the metallurgist.—**Reported by A. J. Fletcher for Mahoning Valley.**

Silver Brazing Process Subject at Quebec Chapter

Speaker: J. S. Fullerton

Handy & Harman of Canada Ltd.

At a recent meeting of the **Quebec Chapter,** J. S. Fullerton, sales manager, Handy and Harman of Canada Ltd., gave a talk on "Silver Brazing Alloys as a Machine Tool".

Mr. Fullerton introduced his talk by mentioning that silver alloy brazing had been used by the Egyptians about 3000 B.C. However, the modern use of this method of joining dated from the last quarter of the 19th century. At that period and for some time afterwards craftsmen prepared their own particular alloys, usually differing from others by slight variations in composition. Handy and Harman did much in the early days towards standardizing the alloys and developing new ones with low flow-points.

During the last war, an urgent need arose for machine tools to meet war-time requirements. Silver brazing performed a useful service in carbide tipping of tools and repairing parts. In addition, very real economies in material and production times were found possible in many instances by substituting silver-brazed assemblies of simple lathe-machined parts or pressed components for heavy forgings or castings which had previously required elaborate and expensive machining. Examples illustrated included terminal boxes, variable-pitch propeller balances, ignition harness elbows, and end plates of aircraft machine gun magazines. The last case represented a reduction in production time from 35 min. per unit to 5 min.

Mr. Fullerton briefly reviewed the available alloys and fluxes and described their characteristics. He also mentioned and compared available heating methods.

At the meeting a scholarship awarded by the A. S. M. Foundation for Education and Research was formally presented to Patrice Belanger of Laval University.—**Reported by J. E. Chard for Quebec Chapter.**

National Officers Meet in Oregon

National President Adolph O. Schaefer, Director of Research, Midvale-Heppenstall Co., Spoke on "Application of Emergency Metallurgy to Peacetime Work" at a Meeting Held in Oregon. The meeting was held in honor of William J. Kroll, sustaining members and the national officers. In honoring Dr. Kroll, the Oregon Chapter set up a fund to establish a library collection at Oregon State College, to be known as the "Dr. William J. Kroll Library Collection". Shown are, from left: National Secretary W. H. Eisenman; Dr. Kroll; and Mr. Schaefer. (Photo by R. Gabel)

Discusses Fasteners at Worcester

Leaders at a Recent Meeting in Worcester Included, From Left: Joseph C. Danec, Technical Chairman; H. E. Linsley, Associate Editor, American Machinist, *Who Spoke on "Fasteners for Tomorrow"; and Herbert D. Berry, Vice-Chairman, Who Presided. (Photograph by C. W. Russell for Worcester)*

Speaker: H. E. Linsley
American Machinist

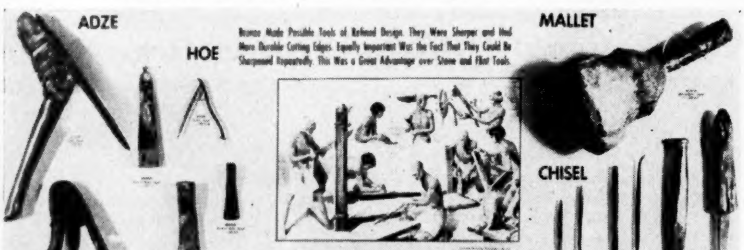
"Fasteners for Tomorrow" was the subject of a talk given by H. E. Linsley, associate editor of *American Machinist* at a meeting of **Worcester Chapter.**

A brief history of fasteners, from man's first attempt to fasten a rock to a stick to use as a club, and strips of sinew being used to attach one bearskin to another, was given by the speaker. After the coming of metals, within a few short centuries, man developed the rivet, the nail and the screw. With advancing years, he acquired the arts of welding, brazing and soldering.

Mr. Linsley pointed out that today fasteners are more accurate and techniques of application are improved, but basically we are still using the same devices we have had for the past 2000 years. In the development of the use of fasteners the familiar practice of slapping parts together and then testing and adjusting, must be eliminated. Component parts must be made so they can be automatically positioned without requiring further adjustment. With proper selection of the most suitable materials, parts should not wear out in less than a predetermined time.

The use of adhesives in the fastening field is not yet sufficiently appreciated. However, Mr. Linsley stated that amazing strides have been made in the development of new adhesives, many of which can produce a bond as strong as the parent metal itself.—**Reported by E. F. Grady for Worcester.**

From Tool Exhibit at St. Louis



A Portion of the Panel Devoted to Bronze Age Tools in the DoAll Co.'s Exhibit Entitled "Civilization Through Tools" Which Was Featured at a Meeting of the St. Louis Chapter. These particular tools were used by the ancient Egyptians and other Near East peoples and are remarkably similar to the tools we see and use today. (Reported by R. D. Leslie)

Toledo Sponsors Lecture Series on Specifications

During the last two weeks in April and the first two weeks in May, the Toledo Chapter sponsored a lecture series entitled "How to Specify Metals and Their Processes". The Spring program included the following:

Heat Resisting Alloys, by F. J. Boron, chief engineer, and R. A. Miller, chief metallurgist, Electro-Alloys Division, American Brake Shoe Co.

Automotive Alloys, by T. A. Frischman, chief metallurgist, Axle Division, Eaton Manufacturing Co.

Nonferrous Alloys, by A. H. Copeland, technical advisor, Revere Copper and Brass Co.

Dollar Metallurgy, by Joseph Gurski, assistant manager, manufacturing research, Ford Motor Co.

Sessions were held in University Hall, University of Toledo, in cooperation with the University.

Compliments

To HAROLD J. ROAST, consulting metallurgist, on being nominated as Honorary Chairman of the Ottawa Valley Chapter, a chapter he has served over many long years of A.S.M. affiliation.

♦ ♦ ♦

To THOMAS D. HAYES, upon his retirement from the U. S. Steel Corp. Mr. Hayes graduated from University of Michigan in 1914 and has been with U. S. Steel since 1934. He has been a member of the A.S.M. since 1918.

♦ ♦ ♦

To JOSEPH LICHT, who will be a third-year metallurgical engineering student at Wayne University, Detroit, on being awarded a $400 scholarship sponsored by the A.S.M. Foundation for Education and Research. Mr. Licht, whose scholastic record rates excellent, was recently elected president of the Epsilon Beta Chapter of Theta Tau, national professional engineering fraternity.

♦ ♦ ♦

To the AMERICAN STEEL AND WIRE DIVISION, U. S. Steel Corp., which has recently celebrated its 125th birthday.

History of Metallurgy Presented at Meeting Of Eastern New York

Speaker: John H. Hollomon
General Electric Research Lab

John H. Hollomon, manager of the metallurgy and ceramics research department, General Electric Research Laboratory, presented a talk entitled "The Future of the Metallurgical Profession" to a well-attended meeting of the **Eastern New York Chapter** and members of the Rensselaer Polytechnic Science of Metals Club. Contrary to the title, Dr. Hollomon's thesis dealt more with the accomplishments of metallurgy over the past 6000 years than with what the future holds in store, but there was little doubt that the combined group of students and metallurgists were keenly interested in his subject.

Opening with the status of metallurgy in the rapidly expanding technological world, where today's metallurgist contributes most significantly in the gap between pure science and engineering, Dr. Hollomon traced the history of metallurgy from the early beginnings of winning metals from their ores in the civilizations of Egypt and Persia to the present day. During historic times, and in many instances today, metallurgy existed as an art, closely related to the ancient arts of ceramics and pottery making. It was in those early, crude beginnings that inorganic process chemistry was born, later embodied in the attempts by "alchemists" to transmute the elements. An analogous situation exists today, according to Dr. Hollomon, as we are still in the very early stages of the process chemistry of the refractory metals such as chromium, molybdenum, tantalum and tungsten, all imperative to the expanding development of high-temperature nuclear, jet and turbine equipment.

Correlated to the basic process chemistry, but of much more recent origin, is the development of metallography, the quantitative control of microstructure and properties by application of basic metallurgical principles. In this field the metallurgist has been singularly successful and his future prospects are even more encouraging considering such excellent new tools as X-ray diffraction and electron microscopy.

The most promising new field of metallurgical research has been the discovery of fundamental defects in the metallic lattice, called dislocations. Much effort is now being expended on dislocation study in an attempt to explain the basic mechanisms of fracture, deformation and structure change. Recent evidence indicates the possibility of increasing metal strengths 20 to 100-fold through careful control of avoidance of these defects.

In summary, Dr. Hollomon stated that the metallurgy profession in the past has encompassed the skills of blacksmithing, ceramics, engineering and chemistry, and if the metallurgist is to promote the application of new scientific knowledge and technology he can still be called upon to demonstrate this versatile ability.—**Reported by N. E. Doyle, Jr., for Eastern New York.**

Honor Long-Time Member in Syracuse

C. T. Patterson (Right), Solvay Process Division, Allied Chemical and Paint Corp., Was Honored at a Meeting of Syracuse Chapter as a Token of Esteem Upon His Retirement After 35 Years With the Company. Don Taylor is shown presenting a portable radio to Mr. Patterson, who is a past chairman of the Chapter and well known for his interest in Society activities. (Photograph by D. B. Blackwood for Syracuse Chapter)

Brittle Fracture Problem Outlined at Saginaw Valley

Speaker: W. S. Pellini
Naval Research Laboratory

William S. Pellini, superintendent, Metallurgy Division, Naval Research Laboratory, presented a talk on "Aspects of Welding Metallurgy" before a joint meeting of the **Saginaw Valley Chapter** and the American Welding Society.

The talk was primarily concerned with brittle fracture and its effect on large welded structures, together with an analysis of the progress made to date in the solution of the problem. A short history of the problem and of the development of preventive measures was presented. Though brittle fractures had occurred from time to time in large welded structures such as bridges and storage tanks prior to World War II, a full-scale investigation of the phenomenon was not initiated until a large number of brittle fractures began to occur in the welded steel ships which were built during that war.

Analysis indicated that the failed material had conformed to existing specifications and that the fractures usually occurred in periods of cold weather. It was found that stress-concentrating defects, such as fine weld cracks, nucleated the fractures. Various investigations involving large test specimens revealed that at warm temperatures, these steels behaved in ductile fashion, but that below certain critical temperatures they behaved in brittle fashion. This transformation from ductile to brittle fracture with decrease in temperature could be shown also by the Charpy impact test. With the development of laboratory test correlations, it was possible to set performance specifications for the steel used in these applications.

A rather unique test was devised by the Naval Research Laboratory during investigation of this problem. A bead of brittle, hard-facing alloy was welded to the surface of a large plate sample and an explosive charge was set off under it. The brittle alloy cracked at the slightest bending force, introducing a sharp crack into the plate under test. Depending on temperature and susceptibility to brittle fracture, the plate failed either in ductile or brittle fashion. The speaker showed how these test results could be correlated with the Charpy V-notch impact test and with service performance.

The entire talk was illustrated with slides. The meeting was concluded with an extensive question and answer session.—**Reported by W. N. Kvintus for Saginaw Valley.**

Ladies Night Features Talk on Gems

Shown at the Ladies Night Meeting of the Dayton Chapter Are, From Left: Mrs. Harold Reindl; Mrs. Edward Herschede, Jr.; Mrs. Walter Ridd; Walter Ridd, Executive Committee; Harold Reindl, Chairman; and Edward Herschede, Jr., Who Presented a Talk Entitled "Gems and Their Evaluation"

Speaker: E. Herschede, Jr.

Gemologist

Edward Herschede, Jr., well-known gemologist from Cincinnati, Ohio, spoke before the **Dayton Chapter** Ladies Night meeting on "Gems and Their Evaluation".

Mr. Herschede reviewed the many variations of gems familiar to the jewelry industry and discussed the variations of their physical make-up which establish their value. He also discussed the determining factors in diamond evaluations.

The factors involved in gem evaluation include beauty, rarity, durability and fashion. The tests used in gem classification determinations were listed as refractive index and density determination, and the X-ray diffraction pattern examination. It was shown that most gems are colorless in their pure state and that the many colors result from the variations in the mineral oxide impurities. Specific colors are usually associated to specific gem classifications; however, any type of gem may exist in a variety of different colors.

The differences in the physical properties of artificial and natural gems were also discussed. It was shown that artificial gems usually show minute entrapped gas bubbles resulting from their fast solidification during cooling. Natural gems never show these rounded gas bubbles as their internal defects are always angular in shape.

The important factors in diamond evaluations are color, perfection, cutting style and diamond size. Mr. Herschede listed 16 degrees of diamond whiteness comparisons and pointed out that any decreasing tendency of whiteness results in a corresponding brilliance decrease. Brilliance always accentuates an increase in the apparent diamond size and the brilliance of most diamonds can be increased at least 20% with the proper cutting method.

The degree of diamond perfection resides in its relative freedom of internal defects. Defects in a diamond are referred to as "carbon". Factors, such as the external shape, and condition, and the cutting style also greatly influence a diamond evaluation.—**Reported by Walter J. Ridd for Dayton.**

Physical Metallurgy and Metallography of Titanium And Its Alloys Explained

Speaker: W. W. Wentz

Rem-Cru Titanium, Inc.

William W. Wentz, research metallurgist, Rem-Cru Titanium, Inc., addressed the **Junior Section of the Philadelphia Chapter** on the "Physical Metallurgy and Metallography of Titanium and Its Alloys".

Titanium was first introduced as a structural material in the early 1940's and, during the last two decades, several useful alloy systems have been developed. The alloy systems are, in general, divided into three types: the alpha, close-packed hexagonal structure; the beta, body-centered cubic structure; and the alpha plus beta structure. The desired structural type is obtained by adding alloying elements which stabilize the desired structure at the operating temperature for the particular alloy. At the present time, the alpha plus beta alloy type is showing the most commercial importance because the combination of the two phases effects a usable compromise of the desirable and undesirable properties of the two single-phase alloys.

A series of interesting slides was shown to illustrate the actual microstructure obtained, along with a discussion of the way this microstructure deviated from that which would be predicted by the phase diagrams under equilibrium conditions. Slides illustrating the effect of gaseous and metallic contaminants were also exhibited.

It was pointed out by Mr. Wentz that a great deal of work has been done to develop suitable heat treating methods for the various alloy systems with some degree of success, but that there are a lot of unknown factors still to be worked out.

Following the formal lecture, an enjoyable discussion period was held to enable the members to bring up specific questions and to ask Mr. Wentz to elaborate on certain parts of his talk.—**Reported by George E. Clauser for Philadelphia Chapter—Junior Section.**

Metals Division S.L.A. To Meet in Pittsburgh

The Metals Division of the Special Libraries Association will hold a Conference on "Putting Knowledge to Work" and "Creative Thinking" on Monday afternoon, June 4, 1956, at the Hotel William Penn, Pittsburgh, Pa., during the S.L.A. Convention, which will run from June 4 through June 7, 1956. Complete program of Metals Division activities is available from: Geraldine D. Anderson, Metals Division, S.L.A., Pittsburgh Consolidation Coal Co., Research and Development Division, Library, Pa.

Stresses Great Importance of Human Relations in Industry

Speaker: E. C. Logelin

U. S. Steel Corp.

The **Calumet Chapter** heard E. C. Logelin, vice-president of the United States Steel Corp., present a talk entitled "A Forward Look".

Mr. Logelin gave a brief history of the founding and development of U. S. Steel's Gary, Ind., works through cooperation between the Corporation and the citizens of the city.

Human relations were stressed as one of the major reasons for the advancement of any organization. The ability to live as a cooperative group, not only on the job but in the community, is of the utmost importance. Each person has an average of 25 people who are his personal audience. On the job his attitude and actions reflect the environment and homelife he enjoys in his off hours and conversely his actions in his community reflect the character of the organization for which he works.

In closing, Mr. Logelin stated that the over-all business outlook is very encouraging and that U. S. Steel is planning expansion of its steel producing capacity this year.—**Reported by T. W. Howlett, Jr., for Calumet.**

Flame Plating Techniques Outlined at Des Moines

Speaker: M. L. Powers
Linde Air Products Co.

M. L. Powers, service engineer, Southwestern Region, Linde Air Products Co., spoke on "Flame Plating" at a meeting in **Des Moines.**

The detonation gun used in the flame plating process employs a barrel and a mechanism for loading precise quantities of tungsten carbide powder, acetylene and oxygen into the firing chamber. The tungsten carbide powder remains suspended in the explosive gases until a spark ignites the mixture producing heat and pressure waves.

The temperature inside the gun reaches 6000° F. when detonation reaches 10,000 psi. The detonation wave carries the partially molten particles of tungsten carbide at supersonic speeds, approximately 9000 f.p.s., to the part to be coated. Much heat is dissipated before the particles strike the workpiece and its temperature remains below 400° F.

The coating thickness ranges between 0.002 and 0.010 in., depending upon the end use of the coated part. The as-deposited finish is 125 micro-in., but the coating can be diamond ground and lapped to finishes as smooth as 0.5 micro-in.

The plated tungsten carbide coating has a hardness of approximately Vickers 1350 and porosity is less than 0.5%. The coating has properties similar to solid carbide but offers the advantage of a bimetal part since it can be deposited on most commercial metals such as aluminum, magnesium, copper, steel, titanium, and others. The coating offers excellent bearing properties and has been used on some applications where the temperature range was as high as 800° F.

Although solid carbide inserts and small tools are highly successful for many applications, they have distinct limitations. Briefly, these involve high cost, size limitations and design requirements. Flame plating affords an extension of the field of carbides because it largely overcomes these objections.

The shape of the part must be considered in making the decision to plate by this process. Since the coating is formed by particles striking the surface at high speeds, only areas which allow particles free and sufficient access can be plated evenly. Spindles, bushings, seals, gages and core rods are only a few of the many current applications for flame plating.—**Reported by E. G. Elliott for Des Moines Chapter.**

Speaks at Penn State on Precipitation Hardening

Speaker: A. J. Lena
Allegheny Ludlum Steel Corp.

"The Metallurgy of Precipitation Hardening Stainless Steels" was the title of the talk given by A. J. Lena, associate director of research, Allegheny Ludlum Steel Corp., at a meeting held by the **Penn State Chapter.**

Precipitation hardening stainless steels show great promise in applications which require superior strength at elevated temperatures. Not only are these steels corrosion resistant but they are responsive to heat treatment after being worked in the more ductile annealed state. Ordinary stainless steels do not have the desired properties of good formability and strength; martensitics exhibit limited workability and are subject to scaling and distortion when heat treated; ferritics do not possess sufficient strength; and austenitic stainless steels are difficult to fabricate after cold working. In an effort to obtain stainless steels which retain corrosion resistance and strength at elevated temperature, precipitation hardening treatments have been developed. By taking carbon into solution during annealing, the martensite transformation temperature may be depressed to a great extent, thus increasing the stability of austenite in an austenitic steel. Upon reheating of the annealed steel, chromium carbide is precipitated at the grain boundaries and the martensitic transformation will occur upon cooling. This treatment imparts strength to the steel but reduces ductility. One alternative is to subject the steel to a freezing treatment, in some cases to temperatures as low as −100° F., where the martensitic transformation can occur. In the absence of carbide at the grain boundaries, greater ductility is retained. Age hardening may then be beneficial to the steel.

A commercial steel containing 17% Cr, 4% Ni, 2.5% Mo, which makes use of a freezing treatment, followed by an aging treatment, was described. Much of the transformation of austenite to martensite at subzero temperatures occurs isothermally.

In closing, Dr. Lena stressed the importance of precipitation hardening stainless steels as competitors with titanium alloys for high-temperature applications. Their strength-to-weight ratios and creep properties are favorable, and stainless steels appear almost inexpensive when compared with titanium alloys.—**Reported by R. G. Dermott for Penn State.**

Reviews Background of Patent Law

Shown at a Meeting of the Lehigh Valley Chapter Are, From Left: John R. Killmer, Chief Metallurgical Engineer, Bethlehem Steel Co.; W. Philip Churchill, Senior Partner in the Law Firm of Fish, Richardson and Neave, Who Was Guest Speaker; and C. B. Post, Carpenter Steel Co., Chairman

Speaker: W. P. Churchill
Fish, Richardson and Neave

The "History of Patent Law and Its Relation to Metallurgy" was reviewed at a meeting of the **Lehigh Valley Chapter** by W. Philip Churchill, partner in the law firm of Fish, Richardson and Neave.

Mr. Churchill stated that the basis for the present patent system in this country was laid down in the Constitution to promote inventions and provide for their disclosure and ultimate availability as public property. In return, the inventor receives an exclusive monopoly for 17 years. A transcript of the first patent, issued in 1790, was exhibited by the speaker. Today, there are more than 2,700,000 patents in this country.

A good patent is not necessarily one containing numerous claims. The basic patent on austenitic stainless steel contained only one claim, yet it is one of the most valuable metallurgical patents on record. The claim or claims of a patent must not be too broad lest they be invalid, and should not be so narrow that they can be easily avoided with impunity. Major claims of several metallurgical patents involved in litigation were reviewed to illustrate the various legal points which must be considered in drafting and writing a sound patent.—**Reported by R. H. Holloway for Lehigh Valley.**

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared by the Technical Information Division of Battelle Memorial Institute, Columbus, Ohio

A — General Metallurgical

147-A. Don't Waste That Acid. E. W. Neben. *American Machinist,* v. 100, Feb. 27, 1956, p. 120-121.

Many platers are beginning to appreciate the serious losses they are suffering through high raw material and operating costs as a result of dumping. An effective way to avoid the loss is described in an acid recovery system, using concentration by evaporation. Diagram, photograph. (A8, L17, Cr, Mg, Zn, Cu, Ni, Ag, Au, ST)

148-A. Why. . . Disaster Control. William M. Stocker, Jr. *American Machinist,* v. 100, Feb. 27, 1956, p. 130-138.

The need for some degree of organized disaster control in every plant—and particularly in every metalworking plant. Basic information for setting up a program and some steps for getting out of trouble. Photographs, diagrams. (A7)

149-A. An Introduction to Incentive Systems. John L. Carter. *Foundry,* v. 84, Feb. 1956, p. 75-77.

A successful incentive system must be preceded by adoption of efficient equipment and methods. Photograph. (A5, E general)

150-A. Control System Cuts Costs in Industrial Truck Operation. Francis A. Westbrook. *Foundry,* v. 84, Feb. 1956, p. 130, 132, 134.

Large steel plant has developed a traffic control-system that speeds up handling, saves maintenance man hours, reduces accidents. Photographs. (A5, E general)

151-A. Cleaning of Open Hearth Stack Gases. III. Leslie Silverman. *Industrial Heating,* v. 23, Feb. 1956, p. 322, 324, 326, 354.

Data for gas cleaning method based on combination of the continuous recycle filter and particle agglomeration. Diagram, table. 5 ref. (A8, D2)

152-A. The Noise Problem in Foundries. *Modern Castings,* v. 29, Mar. 1956, p. 37-52.

Recent legal decisions which have held industry liable for hearing losses by workers explained in special section prepared from material supplied by the Noise Control Committee of the American Foundrymen's Society. Photographs, diagram, graphs, tables. (A7)

153-A. Handling Alpha-Active, Pyrophoric Materials. I. What Is the Best Approach? L. R. Kelman, W. D. Wilkinson, A. B. Shuck and R. C. Goertz. *Nucleonics,* v. 14, Mar. 1956, p. 61-65.

Design and operation details of existing glovebox systems for handling plutonium; philosophy and rules of handling alpha emitters; electrically connected master-slave manipulators. Diagrams, photograph, table. 13 ref. (A7, H general, Pu)

154-A. Abundances of the Elements. Hans E. Suess and Harold C. Urey. *Reviews of Modern Physics,* v. 28, Jan. 1956, p. 53-74.

Discusses elements with respect to their abundance values and adopted values of these abundances. Based essentially on Goldschmidt's empirical values together with new data from recent literature. In general, Urey's recent abundance table, which uses analyses of the chondrites in preference to other averages, is used rather than other tables. Tables, graphs. 102 ref. (A4)

155-A. Pilot Plant for Metals. *Westinghouse Engineer,* v. 16, Mar. 1956, p. 47-49.

Layout and equipment of new metallurgical pilot plant for investigating and developing new processing and production methods. Photographs. (A5, A9)

156-A. Experimental Facilities Provided in the Materials Testing Reactor. R. K. Winkleblack. *Argonne National Laboratory, Preliminary Report (U. S. Atomic Energy Commission),* ANL-4551, Dec. 1949, 39 p.

General site of the reactor's facilities, laboratories and shops, details of experimental facilities. Diagrams, graphs, tables. 6 ref. (A general)

157-A. (Italian.) **The Interest of the Study of Radiation Effects on Solids.** Guido Bonfiglioli, Ernesto Coen, Renato Malvano, Carlo Tribuno and Carlo Mussa. *Ricerca scientifica,* v. 25, no. 11, Nov. 1955, p. 3011-3024.

Illustrates actual state of knowledge about radiation damage phenomena in solids and interest from the point of view of applications as well as of solid state physics. 54 ref. (A general)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

158-A. Methods of Conducting Classes for Electroplaters. Ezra A. Blount. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 107-112.

Classes currently being conducted in private educational institutions and in public school systems, comparing specific courses of study, course outlines, methods of teaching and other details. Table, photographs. (A3, L17)

159-A. Outlook for the Distribution of Nonferrous Metals. Simon D. Strauss. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 222-224.

Current economic position of cadmium, copper, zinc and silver. (A4, Cd, Cu, Zn, Ag)

160-A. Automatic Control in the Steel Industry. R. W. Holman. *American Iron and Steel Institute, Preprint,* 1955, 18 p.

Brief explanation of automation. Automatic control applications in cold reduction mills, coal chemical processing plant and in openhearth shop. Continuous processing lines, control system types, telemetering and supervisory control, and control systems without moving parts described. Photographs, diagrams, graphs. (A5, D general, F general, ST)

161-A. The Impending Shortage of Engineers. Hugo E. Johnson. *American Iron and Steel Institute, Preprint,* 1955, 4 p.

Current situation, present and future requirements, corrective measures involving schools, colleges and industrial organizations. Tables, graphs. 18 ref. (A3)

162-A. (German.) **Contribution to the Problem of Long and Short Time Prognosis of the Anticipated Trends in the Economic Development of the Steel Industry.** Horst Bohr. *Stahl und Eisen,* v. 76, no. 3, Feb. 9, 1956, p. 158-163.

Includes graphs, table. 23 ref. (A4, ST)

163-A. (Book.) **Accident Prevention in Nonferrous - Metal Processing Plants. Sec. III. Smelters, Refineries, and Reduction Plants.** A Bureau of Mines Handbook. 499 p. 1955. United States Government Printing Office, Washington, D. C. $2.00.

Review of industrial safety and health protective measures in connection with materials handling and processing equipment. (A7, C general)

164-A. (Book.) **Fourth Annual Symposium on Hot Laboratories and Equipment. Held in Washington, D. C., Sept. 29, and 30, 1955.** TID-5280 (Suppl. 1). 123 p. 1956. U. S. Atomic Energy Commission. Available from the Office of Technical Services, Department of Commerce, Washington 25, D. C.

Machining, shielding, manipulating, storage, tension testing, transfer, viewing and other operations and associated problems. (A9)

165-A. (Book.) **Liquid Metals Handbook. Sodium (Nak) Supplement.** Carrie B. Jackson, R. R. Miller, R. C. Werner, R. A. Tidball, H. E. Grantz, and R. E. Lee, editors. 3rd Ed. 445 p. 1955. U. S. Atomic Energy Commission and Department of the Navy. Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $2.00.

A comprehensive compilation of experimental data, and analysis and results from practical experience in liquid metal technology. Emphasis placed on properties, fundamentals, system design, components, safety and fire protection, and applications. (A general, Na)

166-A. (Book.) **Alloy Series in Physical Metallurgy.** Morton C. Smith. 338 p. 1956. Harper & Brothers, 49 East 33rd Street, New York 16, N. Y.

Effects of composition and of heat treatment on structures and properties of metals and their alloys. (A general)

167-A. (Book.) **Principles of Physical Metallurgy.** Morton C. Smith. 417 p. 1956. Harper & Brothers, 49 East 33rd St., New York 16, N. Y.

The science of metal behavior presented as an integrated, consistent and satisfying chain of reasoning, extending from the familiar principles of physics and chemistry to the observed behavior of the industrial metals and their alloys. (A general)

168-A. (Book.) **Henley's Twentieth Century Book of Formulas, Processes and Trade Secrets.** Gardner D. Hiscox, editor. Rev. Ed. 867 p. 1955. Norman W. Henley Publishing Co., 254 West 54th Street, New York, N. Y. $5.00.

Data on materials and processes, including adhesives, coatings, alloy compositions and properties, and many recipes useful in the laboratory. (A general)

169-A. (Book.) **Economic Geography of Industrial Materials.** Albert S. Carlson, editor. 494 p. 1956. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. $12.50.

Covers population and transportation, fuel and power, mineral products (to include iron and steel, aluminum, copper, nickel, titanium and lead), natural and synthetic products, and food products. (A4, B10, Fe, Al, Cu, Ni, Ti, Pb)

B

Raw Materials and Ore Preparation

69-B. Flotation. Nathaniel Arbiter. *Industrial and Engineering Chemistry,* v. 48, Mar. 1956, pt. 2, p. 527-531.

Theory and surface chemistry of flotation, its application in the separation of solids, description of plant operations. Photographs. 148 ref. (B14)

70-B. Size Reduction. Lincoln T. Work. *Industrial and Engineering Chemistry,* v. 48, Mar. 1956, pt. 2, p. 556-559.

Various aspects of particle size reduction and control size measurement, grinding, classification, applications. Photographs. 107 ref. (B13)

71-B. The Choice and Construction of Monolithic Linings for Twin Bath Induction Furnaces for Melting Aluminum Alloys. II. E. J. Thackwell. *Industrial Heating,* v. 23, Feb. 1956, p. 372, 374, 376-377.

Effect of furnace design on method of ramming and preparation of ramming material. (To be continued.) (B19, E10, Al)

72-B. Recent Developments—Sintering and Pelletizing. Edwin N. Hower and John A. Anthes. *Iron and Steel Engineer,* v. 33, Feb. 1956, p. 60-65; disc., p. 65-67.

Recent demands for upgrading ores and for obtaining more production from blast furnaces are being met through increased use of sinter and pellets. Diagrams, photographs, graph, table. (B16)

73-B. Beneficiation in 1955. Will Mitchell, Jr. *Mining Engineering,* v. 8, Feb. 1956, p. 184-194.

Developments in comminution, separation and concentration. Photographs, diagram. (B14, Fe)

74-B. Depolarizing Magnetite Pulps. M. F. Williams and L. G. Hendrickson. *Mining Engineering,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 205, Feb. 1956, p. 201-209.

Apparatus and procedures for reducing or eliminating residual magnetism in heavy-medium separation of ferromagnetic materials such as magnetite or ferrosilicon. Diagrams, tables, graphs. 11 ref. (B14, Fe)

75-B. Preliminary Investigation of Carbonate Leaching. Edmund G. Brown. *American Cyanamid Company, Raw Materials Development Laboratory (U. S. Atomic Energy Commission),* ACCO-36, Oct. 1953, 32 p.

The procedure giving best extraction of uranium involved leaching at 95° C. for 24 hr. with 10% sodium carbonate solution containing 5% sodium bicarbonate and 35 lb. per ton of potassium permanganate; extraction of 89.9% of the uranium was effected by this procedure. Tables. 3 ref. (B14, U)

76-B. Concentration of Low Grade Ores at the Humboldt Mine. Richard R. Smith. *Blast Furnace and Steel Plant,* v. 44, Mar. 1956, p. 309-314.

Description of mine and plant, flotation process, initial plant startup, operation. Photographs, tables. 7 ref. (B14, Fe)

77-B. The Choice and Construction of Monolithic Linings for Twin Bath Induction Furnaces for Melting Aluminum Alloys. III. E. J. Thackwell. *Industrial Heating,* v. 23, Mar. 1956, p. 598 + 6 p.

Ramming method and step-by-step formation of the lining for the aluminum melting furnace. Diagram, photographs. (To be continued.) (B19, E10, Al)

78-B. (French.) **Thermal Characteristics of Insulating Refractory Products.** L. Halm and P. Lapoujade. *Bulletin de la société francaise de ceramique,* 1955, no. 29, Oct.-Dec. 1955, p. 3-19.

Effect of porosity, and size and shape of pores on variation of the coefficient of thermal properties. Description of apparatus for determining thermal properties. Tables, graphs, photograph, diagrams. 22 ref. (B19, P11)

79-B. (French.) **Study of Heat Shock Resistance of Certain Sintered Refractories.** M. S. Tacvorian. *Bulletin de la societe francaise de ceramique,* 1955, no. 29, Oct.-Dec. 1955, p. 20-40.

Correlation of cross-breaking strength with heat shock resistance. Studies of bodies containing alumina and chromium and other refractory combinations. Tables, graphs, photographs, diagram. 12 ref. (B19)

80-B. (Italian.) **Principal Corrective Elements of Cast Iron and Steel. Their Influence and Use.** *Fonderia,* v. 5, no. 1, Jan. 1956, p. 49, 51, 53, 55.

Influence and use of calcium, boron, carbon, cobalt and chromium as corrective elements. (To be continued.) (B22, CI)

81-B. (Polish.) **Problems Relating to the Beneficiation of Polish Iron Ores.** Tadeusz Szreter. *Hutnik,* v. 22, no. 10, Oct. 1955, p. 350-358.

Review of iron ore beneficiation methods. Postwar research in Poland and Germany on the possibility of concentrating certain Polish ores. Analysis and porosity of Czech, Slovak, Swedish and Polish siderites. Other foreign and native ores compared. Tables. 44 ref. (B14, Fe)

82-B. (Polish.) **Cooling of Iron-Ore Agglomerates.** Tadeusz Sloniowski. *Hutnik,* v. 22, no. 10, Oct. 1955, p. 369-371.

Cooling by air, water or by both before charging blast furnace. Effect of agglomerate properties on cooling process. Diagram. 7 ref. (B16, D1, Fe)

83-B. Cyclones in Closed-Circuit Grinding. Richard W. Krebs. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb. 1956, 18 p.

Operational data on several diversified applications of the cyclone classifier in the mining industry. Some features of design and control. Graph, tables. (B13)

84-B. Economic Determination of a Mining and Milling Project for A.I.M.E. James Boyd. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 7 p.

Some of the many complicated technical and economic factors which a prospective investor in a mining and milling project must evaluate. (B12, B13)

85-B. Flotation Studies With Alkyl Chelate Type Collectors. I. A. Patel, K. U. Patel, M. F. Obrecht and C. C. DeWitt. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb. 1956, 7 p.

Data on the flotation separation of cassiterite, rutile, ilmenite, calamine and willemite, and iron oxide from taconite. Gaphs, tables. 43 ref. (B14)

86-B. Flowsheets—Types and Uses. O. W. Walvoord. *American Institute of Mining Mettallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 15 p.

Flowsheet types and their relative advantages. Diagrams, tables. (B14, B13)

87-B. Formal Discussion on Jigs. A. P. Massmann. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 7 p.

Factors involved in good performance of jig. (B14)

88-B. The Impact of New Flocculants on Hydrometallurgical Processes. R. S. Olson. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb. 1956, 15 p.

Properties of new flocculants and changes which they may bring about in hydrometallurgical operations. Graphs, photographs. (B14)

89-B. A Kinetic Study of the Leaching of Molybdenite. William H. Dresher, Milton E. Wadsworth and W. Martin Fassell, Jr. *American Institute of Mining Metallurgical and*

Petroleum Engineers, Preprint, 1956, Feb. 1956, 30 p.

Dissolution rate of molybdenite in alkaline solution; effects of temperature, oxygen over-pressure and potassium hydroxide concentration. Graphs, tables 16 ref. (B14, Mo)

90-B. Laboratory Recovery of an Oxidized Lead Mineral From a Southeast Missouri Deposit. M. M. Fine and E. J. Haug. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1955, Apr. 1956, p. 390-392.

A more complete recovery of the cerussite was effected by flotation with a tall oil than by gravity concentration or conventional sulhpidization flotation. Tables. 2 ref. (B14, Pb)

91-B. Modernization of Bunker Hill Pre-Sintering Practices. Harold E. Lee and Donald Ingvoldstad. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb. 1956, 15 p.

Background of original plant, design and operation of new crushing charge storage and proportioning, bedding and pelletizing plants. Tables, diagrams. (B13, B16, Zn)

92-B. Preconcentration of Primary Uranium Ores by Flotation. Burt C. Mariacher. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb., 8 p.

A flotation process was developed from an investigation to determine the amenability of primary uranium ores to preconcentration by methods based on the physical properties of the ore. Tables, diagram. (B14, U)

93-B. Principles and New Developments in Uranium Leaching. A. M. Gaudin. *American Institute of Mining, Metallurgical and Petroleum Engineers, Preprint,* 1955, Aug. 1955, 18 p.

New ideas that have changed the technology of uranium leaching since the war, including continuous leaching, use of noncorrosive liquors, use of ambient, temperature, and new processes for extraction. Tables. (B14, U)

94-B. Production of Granules (Pelletizing) From Dusts and Small-Particle-Size Materials. H. F. Reich. *Henry Brutcher Translation No.* 3638, 13 p. (From *Chemie-Ingenieur-Technik,* v. 25, no. 8/9, 1953, p. 437-441). Henry Brutcher, Altadena, Calif.

Granules produced by the avalanche and surface-tension processes, with special reference to the Eirich mixer. Principles and underlying physics. Table, graph, diagrams, photograph. 2 ref. (B16)

95-B. (Dutch.) **X-Ray Diffraction Analysis of Magnesite Floors.** P. M. De Wolff. *T.N.O.-Niews,* v. 11, no. 119, Feb. 1956, p. 49-54.

Identification of phases in a large number of experimental and used floors; study of crystal structure in these phases. Photograph, electron micrograph, diagram. 2 ref. (B19, D2)

96-B. (French.) **Demagnetization, by Action of Alternating Magnetic Fields, of Magnetite and Alpha-Iron Sesquioxide.** Francine Rimbert. *Comptes rendus,* v. 242, no. 7, Feb. 7, 1956, p. 890-893.

Essential facts relative to isothermal residual magnetization (ARI) and to thermo residual magnetization (ATR). Tables, graph. 3 ref. (B14, P16, Fe)

97-B. (German.) **Possibilities of Errors in the Estimation of Particle Size Distributions.** W. Batel. *Chemie-Ingenieur-Technik,* v. 28, no. 2, Feb. 1956, p. 81-87.

Attempts to state the main sources of error in sampling and means of avoiding them. Tables, graphs, diagrams. 36 ref. (B11)

98-B. (German.) **Mechanical Methods of Ore Treatment.** H. Trawinski. *Chemie-Ingenieur-Technik,* v. 28, no. 2, Feb. 1956, p. 97-106.

Flotation, and pre and after treatments pertaining to flotation. Graphs, diagrams. 49 ref. (B13, B14)

99-B. (German.) **New Ways for Assessing the Coke Strength by Screening Classification and Tumbler Test.** Friedrich Wesemann, Ulrich Graf and Rolf Wartmann. *Stahl und Eisen,* v. 76, no. 3, Feb. 9, 1956, p. 133-144.

Fundamentals for the development of a new quality index and its graphic representation. Consistency, accuracy of individual determinations, influence of transportation and of tumbling time. Validity and sensitiveness of the new index number. Comparison with the results of other testing methods. Graphs, micrographs, tables. 13 ref. (B18, B22)

100-B. (German.) **Mechanization of the Process of Testing the Strength of Blast Furnace Coke and Test Results Obtained in an Integrated Steelworks.** Wilhelm Wolf. *Stahl und Eisen,* v. 76, no. 3, Feb. 9, 1956, p. 145-150; disc. p. 150-152.

Development testing methods, mechanization of the screening process, description of the screening machine and its method of operation. Results obtained. Diagrams, graphs, photographs. 2 ref. (B22, D1)

101-B. (Book.) **Refractories. Their Manufacture, Properties and Uses.** Manohar L. Misra. 151 p. 1954. Benares Hindu University, Benares. $2.10.

General information on refractories and refractory requirements of Indian industry. (B19)

C Nonferrous Extraction and Refining

108-C. Fusion Electrolysis of Bismuth Trichloride. Paul M. Gruzensky. *Electrochemical Society, Journal,* v. 103, Mar. 1956, p. 171-173.

Bismuth was deposited from a fused electrolyte containing 33 wt. % bismuth trichloride in a lithium chloride-potassium chloride eutectic mixture as carrier salt at approximately 400° C. The electrolyte was maintained at desired temperature by electrolyzing current. Cathode current efficiency was nearly 100% and average yield was 88.8%. Diagram, graph, table. 9 ref. (C23, Bi)

109-C. Polarization in an Aluminum Reduction Cell. Warren E. Haupin. *Electrochemical Society, Journal,* v. 103, Mar. 1956, p. 174-178.

New method combines technique of current reversal with use of an a.c. bridge for determining polarization in an aluminum reduction cell. Polarization was found to be composed of two parts; one part had a very short time constant and the other a very long time constant. Diagrams, graphs. 8 ref. (C23, Al)

110-C. Effect of the Walls of Electrolytic Cells on Current Distribution. Fumio Hine, Shiro Yoshizawa and Shinzo Okada. *Electrochemical Society, Journal,* v. 103, Mar. 1956, p. 186-193.

The field in the rectangular cell with two parallel and flat plates as electrodes was analyzed. Consideration is not given to polarization phenomena for mathematical convenience. Diagrams, graphs. 11 ref. (C23)

111-C. Continuous Cast Bronze Shapes. G. D. Storm. *Materials & Methods,* v. 43, Feb. 1956, p. 108-110.

Continuous casting minimizes machining with resulting cost savings. Available alloys, properties, applications. Photographs, tables. (C5, Cu, Sn)

112-C. The Development of a Resin-in-Pulp Process and Its Applications to Ores of the White Canyon Area of Utah. R. F. Hollis, C. S. Abrams, C. K. McArthur and T. F. Izzo. *American Cyanamid Company, Raw Materials Development Laboratory (U. S. Atomic Energy Commission),* ACCO-42, June 1954, 23 p.

The development of a process and a machine for the recovery of uranium from acid slurries without accomplishing a liquid-solid separation. Diagrams, tables. (C general, U)

113-C. Examination of Poisoned Ion Exchange Resins From the Western Reefs Pilot Plant. R. H. Kennedy. *American Cyanamid Company, Raw Materials Development Laboratory, (U. S. Atomic Energy Commission),* ACCO-31, Feb. 1953, 10 p.

Tests were made to determine cause of the drop in uranium adsorption capacity of several samples of anion resins which had been used at the uranium pilot plant. Graph, tables. (C general, U)

114-C. A Pilot Plant Test of the Electrolytic Uranium Recovery Process. Galen W. Clevenger. *American Cyanamid Company, Raw Materials Development Laboratory (U. S. Atomic Energy Commission),* ACCO-40, June 1954, 36 p.

Results of a 1000-lb. per day test of a process for leaching uranium from ores with sodium carbonate, followed by simultaneous precipitation of uranium and regeneration of solutions by electrolytic means. Diagrams, graph, photographs, tables. 2 ref. (C23, U)

115-C. Determination of Alpha Activity of Uranium in Mud. C. A. Kienberger, R. E. Greene and C. E. Pepper. *Carbide and Carbon Chemicals Company, K-25 Plant (U. S. Atomic Energy Commission),* K-434, July 1949, 8 p.

Method employs solvent extraction, using diethyl ether and ammonium nitrate, for the recovery of uranium into a state sufficiently pure for electrodeposition and subsequent alpha counting. Table. 3 ref. (C28, U)

116-C. Separation of Hafnium From Zirconium by Extraction of Thiocyanate Complexes. II. Chemical Studies. L. G. Overholser, C. J. Barton and W. R. Grimes. *Carbide and Carbon Chemicals Corporation (U. S. Atomic Energy Commission),* Y-477, Sept. 1949, 35 p.

Partition of thiocyanic acid between hexone and aqueous phases of various compositions investigated. The extracted hafnium and zirconium may be almost quantitatively removed from the hexone phase by contact with sulfuric acid permitting recycle of the hexone phase at the expense of less than 1% of its contained thiocyanic acid. Graphs, tables. 1 ref. (C28, Hf, Zr)

117-C. Some Factors Influencing the Use of Tributyl Phosphate for the Extraction of Uranium in Analysis. T. W. Bartlett. *Carbide and Carbon Chemicals Company, K-25 Plant (U. S. Atomic Energy Commission),* K-706, Feb. 1951, 28 p.

Extraction from nitric acid solutions by tributyl phosphate was favored by the addition of sodium or ammonium nitrate, by high tributyl phosphate concentration in tributyl phosphate-hexane mixtures, and, in the absence of other nitrates, by increasing the nitric acid concentration. Graphs, tables. 15 ref. (C22, U)

118-C. Electrochemical Separations in Non-Aqueous Solutions. G. M. Pound, Gerhard Derge, June Fullmer, Earl Roland and Joan Pacacha. *Carnegie Institute of Technology, Metals Research Laboratory (U. S. Atomic Energy Commission)*, AECD-3700, June, 1954, 42 p.

Electrolytic decomposition potentials of pure fission product metal chlorides in molten lithium chloride-potassium chloride eutectic were measured directly by current-voltage method as a function of temperature, and by a new back-method. It was concluded that certain electrolytic separations of fission product metals, based on difference in decomposition potential, are possible. Table, diagram, graphs. 5 ref. (C23)

119-C. New Chemical Process Wins Chrome From Ore. *Chemical Engineering*, v. 63, Apr. 1956, p. 308-311.

A new chemical-electrolytic process for making high-purity chromium metal from substandard domestic ores, at a rate of 2000 tons per year. Flowsheet, photographs. (C23, Cr)

120-C. Uranium Recovery Leached Zone Processes. Henry M. Heidt, Donald E. Tynan, J. B. Adams and Roger Bart. *International Minerals and Chemical Corporation (U. S. Atomic Energy Commission)*, RMO-2041, Feb. 1955, 64 p.

Summarizes laboratory research and pilot plant development programs on the extraction and recovery of uranium from leached zone extracts. Diagrams, graphs, tables. (C general, B14, U)

121-C. Zr and Hf Production Tailored to Yield Three Products. W. W. Stephens and C. Q. Morrison. *Journal of Metals*, v. 8, Mar. 1956, p. 334-337.

Production process of commercial zirconium sponge, low-hafnium reactor grade zirconium sponge, and hafnium sponge from zirconium-hafnium ore. Diagram, photographs. 3 ref. (C general, Zr, Hf)

122-C. Debismuthizing of Lead. T. R. A. Davey. *Journal of Metals*, v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 206, Mar. 1956, p. 341-350.

Fundamental principles by which bismuth may be removed from lead by pyrometallurgical processes. Qualitative discussion of the phase diagrams followed by presentation of quantitative diagrams. Graphs, tables, diagrams. 30 ref. (C21, Bi, Pb)

123-C. Electrolytic Recovery of Uranium and Vanadium From Climax Leach Liquors. Paul F. Kirk. *Rohm and Haas Company Research Laboratories (U. S. Atomic Energy Commission)*, RMO-2512, Dec. 1952, 18 p.

Electrolytic recovery was found to proceed readily at an average cost of 32 kw.hr. per lb. U_3O_8 with average recovery efficiency of 99%. Diagrams, graph, photographs, tables. (C23, U, V)

124-C. Experimental Production of High-Purity Cobalt. K. K. Kershner, F. W. Hoertel and J. C. Stahl. *U. S. Bureau of Mines, Report of Investigations* 5175, Jan. 1956, 12 p.

Equipment and procedures for electrolytic process which produces cobalt metal with a purity of 99.99% with reference to metallic contaminations. Methods for analyzing purified products. Photographs, diagrams. 23 ref. (C23, Co)

125-C. Laboratory Recovery of Germanium and Cadmium in Sphalerite Concentrates. H. Kenworthy, A. G. Starliper and A. Ollar. *U. S. Bureau of Mines, Report of Investigations* 5190, Jan. 1956, 17 p.

Cadmium and germanium-bearing concentrates from Illinois-Kentucky fluorspar field were found to be amenable to an inert atmosphere fuming process for removing these metals in form of gaseous sulfides. Treating condensed fume by pyrometallurgical methods upgraded the material and provided a means of partly separating constituents. Vapor pressure studies were also conducted. Tables, graphs. 5 ref. (C22, C21, Ge, Cd)

126-C. A Qualitative Evaluation of Several Electrolytes for Electrorefining Bismuth. P. M. Gruzensky and W. J. Crawford. *U. S. Bureau of Mines, Report of Investigations* 5182, Jan. 1956, 32 p.

Most extensive work was done with basic tartrate, hydrochloric acid and hydrofluosilicic acid electrolytes, which produced smooth adherent deposits if low cathode current densities were used. Tables, photographs. 8 ref. (C23, Bi)

127-C. (German.) **Chemistry of Germanium. XXII. Preparation of Metallic Germanium in the Quenching-Tube.** Robert Schwarz and Egon Baronetzky. *Zeitschrift für anorganische und allgemeine Chemie*, v. 282, nos. 1-6, Dec. 1955, p. 280-285.

Starting with germanium tetrachloride, with germanium monochloride as the intermediate product, metallic germanium is produced. Purity of the product is determined by its conductivity. Graph, diagram. 5 ref. (C4, Ge)

128-C. (Polish.) **Metallic Germanium.** Jerzy Perlinski. *Przeglad techniczny*, v. 77, no. 1, Jan. 1956, p. 19-22.

Uses in semiconductors and transistors, raw materials for the production of germanium, obtaining and purification of germanium tetrachloride by chemical methods, methods of refining the metal by melting. Diagram, flowsheets. (C general, B general, T1, Ge)

129-C. (German.) **Pure Silicon.** H. Von Wartenberg. *Zeitschrift für Anorganische und allgemeine Chemie*, v. 283, no. 1-6, Jan. 1956, p. 372-376.

Purification of silicon and elimination of aluminum, zinc and other impurities. Diagram. 5 ref. (C general, Si)

130-C. Ion-Exchange Studies on Carbonate Leach Liquors From Grants, N. M., Ores. Charles S. Abrams. *American Cyanamid Company, Raw Materials Development Laboratory. (U. S. Atomic Energy Commission)*, ACCO-8, Oct. 1951, 20 p.

An investigation of the recovery of uranium from leach liquors by anion exchange resins; leach tests were run with carbonate and bicarbonate solution; over 99% recovery was made. Graphs, tables. (C general, B14, U)

131-C. Recovery of Uranium From Vitro Leach Liquors by Ion Exchange. I. The Effect of Molybdenum on Uranium Adsorption and Subsequent Cyclic Column Testing of Leach Liquor. Norman N. Schiff, Ernest T. Hollis and George W. Lower. *American Cyanamid Company, Raw Materials Development Laboratory (U. S. Atomic Energy Commission)*, ACCO-35, March, 1954, 28 p.

A three-column cyclic ion exchange test run on Vitro leach liquors indicates that uranium can be economically recovered from these liquors by means of an ion exchange column system. Graphs, tables. (C general, B14, U, Mo)

132-C. The Bisulphate Fusion Process for Copper Refinery Slimes Treatment. K. H. Koropp and E. J. Clugston, Jr. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint*, 1956, Feb. 1956, 11 p.

Experimental work on slime treatment, current practice and equipment for fusion process in refinery. Diagrams, tables. 2 ref. (C21, Se, Te, Au, Ag, Cu)

133-C. Data Re Copper Converter Practice in Various Countries. Frank E. Lathe and Lisle Hodnett. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint*, 1956, Feb. 1956, 40 p.

Summary of information from 13 countries on converters and their operation, refractories practice, analysis of matte and slag, converter slag treatment and magnetic control. Tables, graphs. 12 ref. (C21, Cu)

134-C. Development of the Extraction Process for Uranium From South African Gold-Uranium Ores. A. M. Gaudin, R. Schuhmann, Jr., and John Dasher. *American Institute of Mining, Metallurgical and Petroleum Engineers, Preprint*, 1955, Nov. 1955, 35 p.

Steps involved in the process for gold and uranium recovery. Tables, micrograph, diagrams, graph. 12 ref. (C general, U, Au)

135-C. The Great Falls Billet Plant. Roy H. Miller. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint*, 1956, Feb., 7 p.

Construction and operation of a plant for producing, from cathode copper, 3-in. diam. high-phosphorus copper billets. (C5, Cu)

136-C. A Kinetic Study of the Hydrogen Reduction of Cobalt From Ammoniacal Cobalt Sulfate Solutions. Thomas M. Kaneko and Milton E. Wadsworth. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint*, 1956, Feb. 1956, 36 p.

Rate of reduction studied over a hydrogen partial pressure range of 150 to 800 psi. and a temperature range of 150 to 245° C. Graphs, diagram, table. 25 ref. (C2, Co)

137-C. Magnetite in the Hurley Smelter. H. W. Mossman. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint*, 1956, Feb. 1956, 36 p.

Investigation of conditions favoring magnetite formation and reduction in the converter and reverberatory furnace. Graphs, tables. 11 ref. (C21, Cu, Fe)

138-C. Recent Developments in Electrolytic Copper Refining at Canadian Copper Refiners Limited. Stuart S. Forbes. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint*, 1956, Feb. 1956, 14 p.

Buildings and operating procedures, some developments in addition agents, solution control and electrolyte heating. Tables. (C23, Cu)

139-C. Suspended Basic Roof on a Cold Charged Copper Anode Furnace. Guy Bridgstock. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint*, 1956, Feb., 11 p.

Summary of a copper refinery's experiences with a suspended basic roof. Data on life, maintenance, and costs. Tables. (C21, Cu)

140-C. Separation of Hafnium From Zirconium Using Tributyl Phosphate. R. P. Cox and G. H. Beyer. *Ames Laboratory (U. S. Atomic Energy Commission),* ISC-682, Dec. 1955, 14 p.

Feed solution for extraction step can be prepared from the reaction product of caustic and zircon sand. Diagrams, table. 7 ref. (C28, Hf, Zr)

141-C. The Separation of Protactinium and Zirconium by an Anion Exchange Column. A. G. Maddock and W. Pugh. *Journal of Inorganic and Nuclear Chemistry,* v. 2, Feb. 1956, p. 114-117.

Separation by anionic exchange on an Amberlite IRA-400 resin column was tested at macroscopic concentrations of the elements. Graphs. 9 ref. (C28, Pa, Zr)

142-C. (German.) **Aluminum Production Without Electrolysis of Fused Cryolite-Alumina.** H. Ginsberg. *Aluminium,* v. 32, no. 3, Mar. 1956, p. 145-146.

Ziegler process of depositing aluminum from complex organo-aluminum salts with a 7-to-10-fold increase in efficiency. 7 ref. (C23, Al)

143-C. (German.) **Induction and Resistance Smelting Furnaces.** Franz Deutz. *Elektrotechnische Zeitschrift,* v. 8, no. 2, Ausgabe B, Feb. 1956, p. 55-61.

Description of most frequently used induction and resistance furnaces of German origin. Diagrams, photographs. (C21, D5, D6)

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114-D. Open Hearth Furnace Control. E. Whitehead. *Instrument Practice,* v 10, Jan. 1956, p. 44-48; disc., p. 48-50.

Instrumentation for automatic steel furnace regulation. (D2, S16, ST)

115-D. Largest Blast Furnace. *Iron and Steel,* v. 29, Feb. 1956, p. 42-44.

This furnace with a hearth diameter of 29 ft. 9 in. is the largest blast furnace in Europe and has an iron-making capacity of more than 10,000 tons per week. Photographs, table. (D1, Fe)

116-D. Soda Ash Desulphurization. C. E. A. Shanahan. *Iron and Steel,* v. 29, Feb. 1956, p. 45-48.

Calculations of soda slag weight and results of investigations of the soda ash process at two British iron and steel works. Tables. (D1, D9, ST)

117-D. Basic Open-Hearth Steelmaking. J. Gibson. *Iron and Steel,* v. 29, Feb. 1956, p. 55-59.

Cold-metal practice of steelmaking in a British factory built and planned to work the hot metal process. Tables, diagram, graph. (D2, ST)

118-D. Economies in Making Stainless. G. W. Healy and D. C. Hilty. *Steel,* v. 138, Mar. 19, 1956, p. 102, 105, 106.

Studies on oxygen input rates provide basis for cheaper melting practices for stainless steel. Photograph, graphs, table. (D5, SS)

119-D. Vacuum Melting. *Canadian Metals,* v. 19, Feb. 1956, p. 46, 48.

The vacuum melting plant comprises a water-cooled vacuum chamber, which houses a lip-axis tilting crucible furnace, induction heated. Photograph, diagram. (D8, ST)

120-D. Vacuum Melted Metals. . . An Interim Report. II. Frank T. Chesnut. *Industrial Heating,* v. 23, Mar. 1956, p. 522 + 10 pages.

Current status and recent advances in vacuum refining technology. Table, graphs, photographs. (D8, C25)

121-D. Oxygen Blowing Rate in Stainless Steel Melting. G. W. Healy and D. C. Hilty. *Journal of Metals,* v. 8, Mar. 1956, p. 325-327.

Temperature attained during the oxygen blow results from excess heat input over heat losses; an evaluation of the heat balance of the oxidizing period has been made. Graphs. 5 ref. (D5, SS)

122-D. Rate of FeO Reduction From a CaO-SiO_2-Al_2O_3 Slag by Carbon-Saturated Iron. W. O. Philbrook and L. D. Kirkbride. *Journal of Metals,* v. 8; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 206, Mar. 1956, p. 351-356.

The reduction of FeO from blast furnace-type slags containing less than 5% FeO and melted over carbon-saturated iron in stationary graphite crucibles, and the part played by FeO reduction in the mechanism of desulphurization of iron by slags. Tables, graphs. 12 ref. (D1, Fe)

123-D. (Czech.) **Should One Build Completely Basic Openhearth Furnaces?** Oldrich Bohus. *Hutnik,* v. 5, no. 11, Nov. 1955, p. 323-325.

Economic and operational data from industry proves that openhearths, lined entirely with basic refractories, are efficient and worth constructing. Factors include types and efficiency of fuels and refractories used, types of roof or crown heating, and cooling and service-life of crowns. Tables. (D2)

124-D. (Czech.) **Determining the Properties of Slags From a Basic Openhearth Furnace by Their Appearance: Importance of Determining the Progress of the Melting Process.** Jaroslav Becvar. *Hutnik,* v. 5, no. 11, Nov. 1955, p. 325-328.

Rapid inspection method for checking proper degree of basicity and content of metallic oxides of slag samples to guarantee good-quality steel. Photographs. (D2, B21, ST)

125-D. (French.) **General Review of Ferrous Metal Horizontal or Oblique Continuous Casting Processes.** A. Bungeroth. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 13, no. 1, 1956, p. 89-124.

Process of solidification of continuously cast steel. Effects of length of ingot mold and casting speed. Hourly production of an installation, capacity of furnaces and control of casting speed. Diagrams, graphs, tables. 22 ref. (D9, ST)

126-D. (French.) **Behavior of Different Types of Furnace Bottoms During Blasting.** M. Demarteau. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 13, no. 1, 1956, p. 147-155.

Study of flow-pressure curves for different types of bessemer converter bottoms. Effects of various tuyeres, tubes, and spindles. Graphs. (D3, ST)

127-D. (French.) **Industrial Results Obtained With Converters Having Cylindrical Sections, Low Bath Height, and Large-Diameter Bottoms.** M. Gombert and J. de Hedouville. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 13, no. 1, 1956, p. 157-168.

Influence of factors determining the blasting ability of charges in three basic bessemer converters of 13, 19 and 30-ton capacity. Diagrams, table. 4 ref. (D3, ST)

128-D. (French.) **Induction Melting Furnace at the Bofors Steel Works.** T. Hahn. *Métallurgie et la construction mécanique,* v. 88, no. 1, Jan. 1956, p. 31, 33-34.

Construction and electrical equipment of the 12-ton high-frequency furnaces at steel works in Sweden. Annual production is about 21,000 tons of steel. Photographs, diagram. (D6, ST)

129-D. (Italian.) **Recent Progress in Steelmaking Technology.** Mario Signora. *Fonderia,* v. 5, no. 1, Jan. 1956, p. 33-41.

Iron production in blast and low-shaft furnaces; use of oxygen in the production of basic bessemer steel; new control instruments in openhearth furnaces; progress in cold rolling; development of extrusion. Diagrams, table, graph. (D general, F23, F24, ST)

130-D. (Polish.) **Regulation of the Blast Furnace Process.** Wladyslaw Kuczewski. *Hutnik,* v. 22, no. 10, Oct. 1955, p. 358-362.

Describes steps in a perfect reduction process, gives various troubles and deviations encountered in practice. Causes and corrective procedures for accumulation on shaft walls. Effect of variations in composition of charge on slag-metal reactions. Table, diagrams. 7 ref. (D1, Fe)

131-D. (Polish.) **Melting of Chromium-Containing Steel, for Castings, in the Basic Openhearth Furnace, With Full Recovery of Chromium From the Charge.** Tadeusz Mazanek and Wladystaw Hansel. *Hutnik,* v. 22, no. 11, Nov. 1955, p. 405-408.

Polish and foreign experiments in the recovery of chromium from the scrap of chromium steels remelted in basic openhearths. Factors affecting recovery include furnace temperature, quantity of slag, amount of iron oxide in the slag. Graphs, table. 2 ref. (D2, A8, CI, Cr)

132-D. (Russian.) **Improvements in the Technology of Melting Bessemer Pig Iron.** I. G. Polovchenko. *Stal',* v. 16, no. 1, Jan. 1956, p. 7-15.

Research and practice from 1949 to 1955, using Krivoi-Rog ores and agglomerates, with Donets coke as the fuel. Operational details including blowing and charging. Variations in slag and pig iron compositions. Tables. (D3, ST)

133-D. (Russian.) **Study of the Conversion of Phosphorus Pig Iron, Using Radioactive Isotopes.** V. V. Leporskii, A. I. Osipov, M. T. Bul'skii, A. G. Alimov, F. F. Sviridenko, A. M. Skrebtsov and P. N. Slepkanev. *Stal',* v. 16, no. 1, Jan. 1956, p. 19-22.

Openhearth conversion of phosphorus pig iron. Relation between phosphorus content in molten metal and rate of emergence of residual slag in the initial melting period. Graphs, tables. (D2, Fe, ST)

134-D. (Russian.) **Relation Between Microstructure of Slag and Desulfurization of Steel.** T. Sh. Askendarian and A. S. Bertsinskaia. *Stal',* v. 16, no. 1, Jan. 1956, p. 22-29.

By studying slag microstructure, it is possible to determine its basicity, approximate magnesium content and ability to desulfurize the openhearth bath. Desulfurization during

pure boil period and effect of lime addition and other factors in this period. Tables, micrographs, graph. 5 ref. (D2, ST)

135-D. (Russian.) **Problem of the Manufacture of Electric Steel by the Duplex Process.** O. A. Mikhailov. *Stal'*, v. 16, no. 1, Jan. 1956, p. 29-32.

Use of oxygen-blown converter and electric furnace. Acid and basic converters compared. Quality of steel made by the duplex process compares favorably with openhearth steel. Table. 15 ref. (D7, ST)

136-D. (Russian.) **Study of the Continuous Casting Process for Steel.** V. S. Rutes, N. A. Nikolaev, D. P. Evteev, and V. P. Druzhinin. *Stal'*, v. 16, no. 1, Jan. 1956, p. 62-66.

Use of radio-active isotopes and measurement of temperatures within the casting make it possible to determine depth of the liquid phase, location of the crystallization front and the average rate of solidification. Graphs, tables. 8 ref. (D9, ST)

137-D. (Russian.) **Kinetics of Transfer of Sulfur From Pig Iron Into Slag of System $CaO-Al_2O_3$.** O. V. Travin and L. A. Shvartsman. *Zhurnal fizicheskoi khimii*, v. 29, no. 11, Nov. 1955, p. 2031-2041.

Rate of desulfurization of pig iron by slag at various temperatures depending on concentrations in the metal of sulfur, silicon and manganese. Graphs, tables, photograph. 17 ref. (D general, Fe)

138-D. (Spanish.) **Progress in Electric Steelmaking.** Hermann Walde. *Instituto del hierro y del acéro*, v. 8, no. 41, Oct.-Dec. 1955, p. 719-728.

Study of thermal balance and decisive factors in the specific consumption of energy in the electric furnace; advantages of electric steelmaking; behavior of different coals in the electric reduction furnace; duplex process. Diagrams, table, graphs, photographs. (D5, ST)

139-D. Deoxidizers and Tapping Temperatures. H. M. Parker. Part of Preprint Session on Melting of Stainless Steel. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, p. 27-28.

Shop practices regarding tapping temperature and deoxidation. (D5, D9, SS)

140-D. Effect of Medium and High-Carbon Ferrochromium in the Charge on Stainless Melting Practice. L. G. Cotton, Jr. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, 4 p.

Melting practice summarized; effects of ferrochromium additions. Tables. (D5, B22, SS, Ni, Cr)

141-D. Effect of Nitrogen on the Solidity of Medium-Carbon and Low-Alloy Steel Castings. John H. Fuqua. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, 8 p.

Steels produced under conditions ideal for nitrogen absorption investigated as to composition and physical properties. Graphs, tables. (D5, CI, Ti, Al)

142-D. An Efficient Method of Desulphurizing Liquid Pig Iron. B. Trentini, L. Wahl and M. Allard. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint*, 1956, Feb., 9 p.

A rapid, efficient method characterized by intimate contact between metal bath and lime powder blown in through immersed tuyeres. Photographs, graphs, tables. 16 ref. (D3, CI)

143-D. Gas Purging of the Molten Bath in the Electric Arc Furnace. Adam J. Texter. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, 4 p.

Use of oxygen, dried compressor air and fluorine to purge molten metal. Diagram, photographs. (D5, ST)

144-D. Melting Stainless Steel. Richard B. Shaw. Part of Preprint Session on Melting of Stainless Steel. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, p. 1-15.

Brief survey of melting practices. Tables, graphs. 11 ref. (D5, SS)

145-D. Melting Stainless Steel. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, 30 p.

Seven papers, separately abstracted, on various aspects of the melting process. (D5, SS)

146-D. The Melting of Stainless Steel—The Reducing Period. L. F. Weitzenkorn. Part of Preprint Session on Melting of Stainless Steel. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, p. 19-20.

Carbon, metal and slag tests; addition of lime and ferrosilicon; slag removal. (D5, SS)

147-D. Monolithic and Shaped Refractories for the Electric Furnace Roof. H. G. Hart and F. H. Fanning. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, 8 p.

Factors in the use of shaped and monolithic refractories. Types of brick and their advantages. Diagrams. (D5, Si)

148-D. New Control Instruments for Bessemer Steelmaking. P. Leroy. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint*, 1956, Feb. 1956, 11 p.

The volume-debitgraphe, two-color pyrometer, flame pyrometer and opacimeter were developed to supply efficient research tools and closer control of blowing and thermal conditions in daily production work. Photographs, graphs, diagrams. 8 ref. (D3, S16, ST)

149-D. On the Basic Pneumatic Processes of Steelmaking. P. Coheur and H. Kosmider. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint*, 1956, Feb., 12 p.

The basic bessemer process and its present state of development. Mechanical properties of steel made by pneumatic processes. Tables, graphs, diagrams. 62 ref. (D3, Q general, ST)

150-D. Quality Control of Melting Practices. H. H. Johnson and G. A. Fisher. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, 15 p.

Examples of operation and quality controls used in a mechanized melting shop. Graphs, tables. (D5, ST)

151-D. Scrap Charges for 430 Grade Stainless. Anthony J. Mimeth. Part of Preprint Session on Melting of Stainless Steel. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, p. 17.

Standard charging practice followed in a steel plant. (D5, B22, SS)

152-D. Slag-Reducing Agents in the Making of Stainless Steel. Benjamin H. Brown. Part of Preprint Session on Melting of Stainless Steel. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, p. 21-22.

Outlines ferrochromium-silicon reducing process which includes recovery of chromium, preparing metal for sampling, requirements for good practice, and a summary of charge materials and additions. Table, diagrams. (D5, SS, Cr, Si)

153-D. Slag Reduction in the Melting of Stainless Steel. D. J. Carney. Part of Preprint Session on Melting of Stainless Steel. *American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Conference, Preprint*, 1955, p. 23-26.

Some factors affecting reduction of chromium, manganese and iron from slags. 3 ref. (D5, SS)

154-D. Oxygen Converter Process. George B. McMeans. *American Iron and Steel Institute, Preprint*, 1955, 7 p.

Plant, equipment, process, advantages, economic factors. (D8, ST)

155-D. The Oxygen Steelmaking Process. D. O. Davis. *American Iron and Steel Institute, Preprint*, 1955, 17 p.

Plant layout, equipment and operations of steelmaking plant at Dominion Foundries and Steel Ltd. Advantages of method. Photographs, diagrams, graph. (D8, ST)

156-D. Steelmaking Developments During the Past Decade. Karl L. Fetters. *American Iron and Steel Institute, Preprint*, 1955, 12 p.

Comparison of production figures, innovations which have helped in speeding steel production, future requirements, possible new processes to replace openhearth. Graphs, table. (D general, ST)

157-D. Residual Metals in Open Hearth Steel, 1954. John D. Sullivan. *National Open Hearth Committee of the Iron and Steel Division of the A.I.M.E., Proceedings*, v. 38, 1955, p. 130-134; disc., p. 134-139.

Current status of residual elements commonly found in refined basic openhearth steel; use of scrap in furnaces. Tables, graphs. 10 ref. (D2, ST)

158-D. Desulphurization of Steel by Soda Ash Treatment. N. J. Wadia, V. G. Paranjpe and S. Visvanathan. *Tisco*, v. 3, Jan. 1956, p. 1-4.

Experiments on the desulfurization of melts of low-carbon and high-silicon steels with soda ash; effects of varying degrees of prior deoxidation; review of earlier work and comparison with present results. Graphs, tables. 11 ref. (D9, AY, CN)

159-D. Influence of Mechanical Handling of Metallurgical Coke Upon Coke Quality. B. Kalinowski, A. Grossman and F. Janta. *Henry Brutcher Translation No.* 3613, 7 p. (From *Hutnik*, v. 21, no. 10, 1954, p. 324-326.) Henry Brutcher, Altadena, Calif.

Ways of improving transportation and screening practices to get coke of maximum uniformity. Tables. (D1, A5)

160-D. Definition of Combustion in Front of the Tuyeres of Blast Furnaces. W. Kuczewski. *Henry Brutcher Translation No.* 3663, 4 p. (From *Hutnik*, v. 21, no. 4, 1954, p. 100-102.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 323-D, 1954. (D1)

161-D. (German.) **Development and Blowing Properties of a Small Basic Converter.** Wilhelm Anton Fischer and Manfred Wahlster. *Archiv für das Eisenhüttenwesen*, v. 27, no. 2, Feb. 1956, p. 77-84.

Conversion of a 30-kg. graphite-electrode furnace into a basic test-converter. Lining and floor durabilities. Refining with regular and an oxygen-containing blast. Comparison of 2 and −25t converter melting. Shifting of dephosphorization and its effect on nitrogen absorption. Tables, graphs, diagram, photographs. 12 ref (D3)

162-D. (German.) **Development of an Electric Arc Furnace and Control of Its Electrodes.** Albert Driller. *Elektrotechnische Zeitschrift,* v. 8, no. 2, Ausgabe B, Feb. 1956, p. 41-47.

Construction, operation and evaluation of a 120-ton electric furnace with hydraulic electrode adjustment. Graphs, diagrams, photographs. (D5)

163-D. (German.) **A New Hearth Design for an Open-Hearth Furnace.** Franz Bartu and Edgard Boelens. *Stahl und Eisen,* v. 76, no. 3, Feb. 9, 1956, p. 152-158; disc., p. 158.

Novel trials to give the front and back wall of an openhearth furnace a slope against the bath and not away from it, as is customary. Smaller span and increased life of the roof. Diagrams, graphs, photograph, table. (D2)

164-D. (Russian.) **Improvement of 18XhGT Steel Production Technology.** G. M. Borodulin, V. P. Frantsov, S. Z. Iudovich and G. F. Morenko. *Stal',* v. 16, no. 2, Feb. 1956, p. 135-139.

Microstructure and ingot surface improvements result from changes in method of teeming and lubrication of molds. Tables, graph, diagram, photographs, micrographs. (D9, M27, N12, ST)

165-D. (Book.) **National Open Hearth Committee of the Iron and Steel Division of the A.I.M.E., Proceedings (Annual Volume),** v. 38, 1955, 298 p. American Institute of Mining and Metallurgical Engineers, 29 West 39th Street, New York 18, N. Y.

Collection of 37 papers on various aspects of openhearth practice. Includes basic and acid operation, refractories and masonry, operating metallurgy and cold metal and basic foundry practice, and combustion. (D2, Fe, ST)

E
Foundry

232-E. Quality Control in Non-Ferrous Metal Melting. D. D. Stead and P. G. Dodd. *Australasian Engineer,* 1956, Jan. 1956, p. 45-52.

Basic factors affecting quality of molten nonferrous metals in relation to ultimate requirements of the cast product. Methods and precautions involved in controlling these factors. Photographs, table. 20 ref. (E10, Cu, Al, Mg, Zn)

233-E. Risering of Steel Castings. I. H. F. Bishop and W. H. Johnson. *Foundry,* v. 84, Feb. 1956, p. 70-74.

Application of rules for scientifically risering commercial steel castings. Calculation of riser location and size. Graphs, diagrams, photographs. 7 ref. (To be concluded.) (E22, CI)

234-E. Shell Mold Job Shop Makes Variety of Castings. Robert H. Herrmann. *Foundry,* v. 84, Feb. 1956, p. 78-83.

Canadian shop features specially designed equipment and methods, including a unique sand reclamation unit. Photographs, diagrams. (E16)

235-E. Economics of Brass Foundry Operation. Harry St. John. *Foundry,* v. 84, Feb. 1956, p. 84-86.

Accurate cost information and control determine over-all profit. (E general, Cu)

236-E. Selection and Melting of Die Casting Alloys. M. R. Tenenbaum. *Foundry,* v. 84, Feb. 1956, p. 92-95.

Analyses of common die casting alloys, with emphasis on selection, handling and melting. Includes some rules of thumb, applicable to improvement of operating procedures. Tables, photograph. (E13)

237-E. Centrifugal Casting of Aluminum in Permanent Molds. Russell H. Garner. *Foundry,* v. 84, Feb. 1956, p. 96-97.

Equipment used and methods employed. Diagrams. (E12, E14, Al)

238-E. Cooling of Foundry Sands. G. Martin. *Foundry,* v. 84, Feb. 1956, p. 98-103.

Relationship of sand temperatures to casting defects. Results of tests regarding methods of cooling sand. Graphs, table. 3 ref. (E18)

239-E. High-Pressure Molding. Thomas E. Barlow. *Foundry,* v. 84, Mar. 1956, p. 104-109.

Development, present status, future applications, with special emphasis on requirements of molding sands, moisture control, special requirements for large castings, and molding with carbon-dioxide-cured sands. Photographs, graph. (E19)

240-E. Dry Reclamation of Foundry Sand. Henry W. Zimnawoda. *Foundry,* v. 84, Mar. 1956, p. 114-120.

Analysis of operating principles, equipment layouts and costs involved in reclamation systems. Diagrams, photographs, micrograph. (E18)

241-E. Thermal Studies in Shell Molding. Wylie J. Childs and J. B. Hyman. *Foundry,* v. 84, Mar. 1956, p. 121-127.

Study of temperature of shells during investment, curing and pouring operations, effect on residual strength. Data provides guide for selecting correct thickness and strength of shells for given applications. Graphs, photographs. (E16, Al, Cu, ST)

242-E. Dos and Don'ts in Hardening Sand With CO_2. John E. Gotheridge and Frank Pursall. *Foundry,* v. 84, Mar. 1956, p. 128-135.

Detailed discussion of the process, properties required of sands, surface finish and collapsibility, and applications. Diagrams, graphs, photographs. (E18)

243-E. Risering of Steel Castings. H. F. Bishop and W. H. Johnson. *Foundry,* v. 84, Mar. 1956, p. 136-141.

Calculations of riser dimensions for bearing housing castings and ring gear castings; adjusting riser dimensions. Diagrams, photographs, graphs. (E22, CI)

244-E. Here's How to Cast Steel Threads in Gray Iron. *Foundry,* v. 84, Mar. 1956, p. 164-166.

New method cuts material handling costs and eliminates expensive drilling and tapping. Photographs. (E16, SS, CI)

245-E. Permanent Mold Casting Machine Is Electronically Controlled. Thomas A. Dickinson. *Foundry,* v. 84, Mar. 1956, p. 176, 178-179.

Machine designed to produce nonferrous castings in permanent molds with rapid speed, with finish and dimensional tolerances equivalent to those of pressure die castings, and a dense, homogeneous grain structure. Photographs. (E12)

246-E. Fluidity Testing Developments. V. Kondic. *Foundry Trade Journal,* v. 100, Jan. 12, 1956, p. 31-36.

Different tests of fluidity and their possibilities for application in normal foundry operation. A star-type test piece is recommended. Diagram, graph, table. 3 ref. (E25)

247-E. Shanks and Ladles. *Foundry Trade Journal,* v. 100, Jan. 12, 1956, p. 45-47.

Describes and illustrates construction of one-man pouring ladle for foundry work. Photographs, diagram. (E23)

248-E. Co-Operation Between Engineer and Foundryman on Casting Design. Georges Blanc and Marcel Jaumain. *Foundry Trade Journal,* v. 100, Jan. 19, 1956, p. 63-73.

Efforts of French foundrymen and design engineers to cooperate for efficient casting operation. Gives several "before and after" examples. Photographs, diagrams. 12 ref. (E general)

249-E. Silicon-Carbide Shapes as Denseners in the Foundry. H. W. Griffiths. *Foundry Trade Journal,* v. 100, Jan. 19, 1956, p. 75-77.

Application of silicon-carbide blocks in molds to serve as denseners; advantages over cast iron denseners. Photographs, diagrams. (E25, CI)

250-E. The Shaw Process of Precision Casting. *Machinery,* v. 88, Feb. 1956, p. 268-275.

Developments and applications being made by various companies employing the Shaw process in Europe, U.S.A. and Australia. Photographs. (E13, T general)

251-E. The Design of Diecastings and Diecasting Dies. I. W. M. Halliday. *Machinery Lloyd (Overseas Ed.),* v. 28, Feb. 18, 1956, p. 69-71, 73-75.

Section thickness of walls, bosses, ribs and beads; satisfactory and unsatisfactory designs. Diagrams, table. (E13)

252-E. Casting With Carbon Dioxide Hardened Sands. *Mechanical World and Engineering Record,* v. 136, Feb. 1956, p. 54-56.

Hardening procedures. Gas-hardened sands have as chief advantages permanence, lack of distortion, rapidity of production. Capital equipment required is low. Diagrams, graphs. (E19)

253-E. Semi-Collet Diecasting Dies for Reliability and Precision. H. K. Barton. *Mechanical World and Engineering Record,* v. 136, Feb. 1956, p. 66-69.

Constructional features of die elements that move obliquely forward to clear the casting. Diagrams. (E13)

254-E. Pressure Tightness in Gunmetal Castings. M. R. Hinchcliffe. *Metal Industry,* v. 88, Feb. 3, 1956, p. 92-94.

Factors affecting porosity and pressure soundness. Some methods to reduce pressure-test failures. Diagrams. (E11, Cu)

255-E. Pressure Tightness in Gunmetal Castings. II. M. R. Hinchcliffe. *Metal Industry,* v. 88, Feb. 10, 1956, p. 109-111.

Applications and methods of modification to gating systems which have been used where porosity was a source of trouble. Micrographs, diagrams. (To be continued.) (E25, E22, Cu)

256-E. Inclusions and Porosity in Leaded Bronzes. M. R. Hinchcliffe. *Metal Industry,* v. 88, Feb. 17, 1956, p. 129-132.

Practical experiences in founding of various shapes in gunmetals, leaded-copper and nickel bronze. Methods used to overcome inclusions and subsurface porosity. Photo-

graphs, diagrams. 2 ref. (To be continued.) (E25, Cu)

257-E. Foundry Techniques. Pressure Tightness in Gunmetal Castings. M. R. Hinchcliffe. *Metal Industry,* v. 88, Feb. 24, 1956, p. 147-149.

Examples where improvements in gating and running systems aided in overcoming porosity and inclusions in gunmetal castings of various shapes and sizes. Photographs, diagrams. 4 ref. (E22, E25, Cu)

258-E. Will the CO_2 Process Mark a New Epoch in Foundry Practice? Peter Trippe. *Metalworking Production,* v. 100, Jan. 27, 1956, p. 139-144.

Reviews experience with the carbon dioxide foundry process in Britain. Photographs. (E18, E19, E21)

259-E. CO_2 Foundry Process Revolutionizes Production for Aluminium Diecasters. Peter Trippe. *Metalworking Production,* v. 100, (Combined Issue), Feb. 10 and 17, 1956, p. 223-227.

Equipment and process used in production of gear boxes, gear carriers and manifolds for the motor industry. Photographs. (E13, T21, Al)

260-E. "It Couldn't Be Done!" But Small Brass Shop Mechanized Anyway. Vern Carlson. *Modern Castings,* v. 29, Mar. 1956, p. 26-29.

Systematic modernization increased casting quality, cut scrap, improved working conditions for six molders. Photographs, diagram. (E11, Cu)

261-E. Cupola Charging Speeded to Break Production Barrier. H. G. McCallum. *Modern Castings,* v. 29, Mar. 1956, p. 30-33.

Electromagnetic metal charge make-up, revamped coke and limestone handling, skip charging now supply the cupolas with charges fast enough to maintain the desired melting rate. Photographs, diagrams. (E10)

262-E. More Revealing Green Core Test. E. C. Zuppann and H. Putz. *Modern Castings,* v. 29, Mar. 1956, p. 34-36.

Authors refined and adapted the green core impact test to give accurate, reproducible results with a minimum of effort, care, and time. Photographs, diagram. (E21)

263-E. Progress in Taming the Sprue. Goro Ohira. *Modern Castings,* v. 29, Mar. 1956, p. 54-57.

How mold filling time is affected by sprue shape, aspiration, gate size and location. Graphs, diagrams, tables. 5 ref. (E22, Al)

264-E. Automatic Batching Prepares Sand for Molds. *Automation,* v. 3, Apr. 1956, p. 73-74.

Combines typical foundry equipment, weight sensitive load cells, a timer and a controller-recorder to speed up operations. Diagram, photograph. (E18)

265-E. Aluminum Die Casting. J. H. Baird. *Canadian Metals,* v. 19, Feb. 1956, p. 36 + 4 pages.

The cold chamber process. Photographs. (E13, Al)

266-E. Frozen Mercury Casting. *Canadian Metals,* v. 19, Feb. 1956, p. 44-45.

Mercasting is an investment casting technique using frozen mercury rather than wax or plastic as a pattern material. Diagrams. (E15)

267-E. A Study in the Design of Sand Molded Engine Castings. Malcolm R. McKellar. *Engineering Journal,* v. 3, Mar.-Apr. 1956, p. 12-18.

Design factors which must be considered to obtain the most economical production of castings. Diagrams, photographs. (E11)

268-E. Gating Affects Quality in Production of Steel Castings. Hubert Chappie. *Foundry,* v. 84, Apr. 1956, p. 90-93.

Use of best possible gating techniques will go far toward producing castings of superior quality. Photographs, diagram. (E22)

269-E. Synthetic Sands for the Nonferrous Foundry. William Ball, III, and George Schultz. *Foundry,* v. 84, Apr. 1956, p. 106-111.

Operation of a synthetic sand system in a nonferrous foundry requires selection and testing of clays, and analyzing the influence of sand and other factors on casting defects. Graph, tables, photographs. 2 ref. (E18)

270-E. (French.) **Improvements in the Process of Using Cupolas.** M. Jean Guillamon. *Fonderie,* 1956, no. 120, Jan. 1956, p. 21-27; disc., p. 27.

American cupola process for preparation of black-heart malleable cast iron, results of its adoption in France. Diagrams, graphs, tables. 5 ref. (E10, CI)

271-E. (French.) **Prerefining in the Ladle, With Pure Oxygen, of Cast Irons Very Rich in Silicon.** P. Leroy and D. Menendez. *Institut de Recherches de la Siderurgie, Publications,* ser. A., no. 118, Nov. 1955, 25 p.

Experiments resulted in lowering the silicon, manganese and carbon content of the cast irons, increasing the temperature due to prerefining. Tables, graphs. 4 ref. (E25, CI)

272-E. (French.) **The Precision Micro-Foundry and Its Applications in the Aeronautical Industries and in the Special Engines and Rocket Industry.** Pierre Lefranc. *Metaux, Corrosion-Industries,* v. 31, no. 365, Jan. 1956, p. 43-47.

Production of small metal and plastic pieces by the lost-wax process. Graph, photographs. (E15)

273-E. (Hungarian.) **Special Brass. II.** Sandor Polgary. *Ontöde,* v. 7, no. 1, Jan. 1956, p. 9-13.

Melting technology and casting methods. Diagrams. (E10, Cu)

274-E. (Italian.) **Chill Castings.** R. Allara. *Fonderia,* v. 5, no. 1, Jan. 1956, p. 19-23.

Chill-casting process, equipment, advantages. Photograph, diagrams, table. 1 ref. (E11, E25)

275-E. (Italian.) **Prospects for Using Electric Furnaces in the Iron Foundry.** *Fonderia,* v. 5, no. 1, Jan. 1956, p. 43, 45, 47.

Possibilities of using nuclear energy to furnish electricity; technological advantages of high-quality products; economic aspects. (E10, ST)

276-E. (Czech.) **Examination of Melting Conditions and Testing of Refractory Materials in a Small Cupola With Inside Diameter of 100 Mm.** Bretislav Sochor. *Slévarenství,* v. 4, no. 2; *Prace Ceskoslovenského Vyzkumu Slévarenského,* v. 3, no. 28, Feb. 1956, p. 197-202.

Details of its use and best charge size. Acid and basic linings evaluated. Tables, diagram, photographs. (E10)

277-E. (German.) **Investigation of the Effect of Granulation of Molding Sand on Its Compressibility and Behavior During Use.** Franz Hofmann. *Giesserei,* v. 43, no. 5, Mar. 1, 1956, p. 105-108.

Preparation of the test mixture, individual properties related to the granulation, compressibility, permeability, porosity, behavior of quartz sand at high temperature. Table, graphs. 2 ref. (E18)

278-E. (German.) **High-Frequency Dryer and Plastic Core in the Foundry.** Emil Walther. *Giesserei,* v. 43, no. 5, Mar. 1, 1956, p. 109-112.

Fundamentals of high-frequency drying process and the technical characteristics of the dryer, drying cost, practical experiences. Graphs, photographs. (E21)

279-E. (German.) **Effect of New Grain Refining Preparations on Various Properties of GAlSi-Alloys.** Hermann Kessler and Hansludwig Winterstein. *Zeitschrift für Metallkunde,* v. 47, no. 2, Feb. 1956, p. 97-101.

By careful selection of the components and by particularly fine grinding of the mixture after the grain refining substance has been added, it is possible to obtain fine-grained, uniformly distributed primary silicon crystals. Table, micrographs. 4 ref. (E25, Al, Si)

280-E. (Polish.) **Contraction Ribs Prevent Hot Tears in Steel Castings.** Gabriel Kniaginin. *Przeglad Odlewnictwa,* v. 6, no. 2, Feb. 1956, p. 33-39.

Redesigning steel castings to eliminate hot spots that lead to cracking. Optimum angle, size, shape, spacing, thickness of ribs. Relation between dimensions of ribs and those of the walls of the castings. Diagrams, graphs, tables. 8 ref. (E22, E25, CI)

281-E. (Polish.) **Casting of Iron Alloys in Permanent Molds.** Jozef Kuscewski. *Przeglad Odlewnictwa* v. 6, no. 2, Feb. 1956, p. 39-45.

Preparation and design of cast iron molds. Casting techniques and pouring set-up, including sprue and gate design. Foundry cores. Cast iron versus steel molds; service life in relation to weight of castings. Diagrams, table. (E12, CI, ST)

282-E. (Book.) **The Casting of Steel.** W. C. Newell, Ed. 599 p. 1955. Pergamon Press, 4 & 5 Fitzroy Square, London W.1. England.

Covers each phase of the design and commercial production of steel castings, beginning with basic principles. (E general, CI)

F

Primary Mechanical Working

85-F. Production of Large-Diameter Welded Steel Pipes. *Engineering,* v. 181, Feb. 3, 1956, p. 122-124.

Equipment and operating procedures. Diagram, photographs. (F26, ST)

86-F. Abrasive Wheels Simplify Steel Billet Cutting. V. E. Lysaght. *Iron Age,* v. 177, Feb. 16, 1956, p. 99-101.

Modern abrasive cut-off machines as a universal cutting medium. Rubber-bonded wheels are used for the toughest alloys; worn wheels are shifted to smaller machines for economy. Photographs. (F29, AY)

87-F. Resistance Heating Boosts Forging Efficiency. *Iron Age,* v. 177, Feb. 16, 1956, p. 108-110.

Flanged rear-wheel axles for motor vehicles are being forged by a German firm with modern upsetting machines, friction forging presses, after parts are heated by electrical resistance method. Results are improved economy and accuracy, simplified handling, excellent structure. Photographs. (F22)

88-F. Modern Forging Presses and Their Control. R. M. L. Elkan and J. T. Lewis. *Iron and Steel Institute, Journal,* v. 182, Feb. 1956, p. 200-215.

Press construction, drives and hy-

draulic circuit design. Eccentric loading effects, friction, power and compressibility also considered. Tables, photographs, diagrams, graph. 9 ref. (F22)

89-F. The Manufacture of Steel Sheet and Strip. J. Lomas. *Machinery Lloyd (Overseas Ed.),* v. 28, Feb. 18, 1956, p. 81-84.

Processes, differences between hot and cold rolling, applications of each. (F23, ST)

90-F. Plate Levelling and Bending Machines. *Machinery Lloyd (Overseas Ed.)* v. 28, Feb. 4, 1956, p. 91-92.

Heavy duty five-roll plate levelling machine and a five-roll plate bending and straightening machine. Photographs. (F29, G6, ST)

91-F. Roll Force Measurement. R. B. Sims. *Metal Industry,* v. 88, Feb. 17, 1956, p. 125-128.

Describes load meters and tensionmeters and their application to mill equipment. Mentions the first industrial system of automatic gage control to be installed on a cold mill. Photographs, diagrams. 4 ref. (F23, S18)

92-F. Use of Heated Compressed Air in Forging Hammers. F. C. Evans. *Metal Treatment and Drop Forging,* v. 23 Feb. 1956 p. 49-54.

Economic advantages. Two designs of compressed air heaters suitable for industry and practical results of their applications. Diagrams, photograph. 3 ref. (F22)

93-F. Steel Controls Own Weld-Cycle. *Metalworking Production,* v. 100, (Combined Issue), Feb. 10 and 17, 1956, p. 228-230.

Barton tube-welding process gives improved quality and speed of production in pipe welding by permitting the plasticity of the steel being welded to control the weld cycle. Photographs, micrograph, diagram. (F26, ST)

94-F. The Rolling of Metals and Alloys. IX. Hot Rolling: Calculating the Roll-Separating Force. E. C. Larke. *Sheet Metal Industries,* v. 33, no. 346, Feb. 1956, p. 143-148.

Simple method for computing roll separating forces developed when slab and strip materials are hot rolled. Graphs, tables. 6 ref. (To be continued.) (F23, CN)

95-F. Tooling a Heavy Forging Press. Albert E. Favre. *Tool Engineer,* v. 36, Mar. 1956, p. 125-128.

Problems created by necessity for greater precision in forging, especially of aircraft parts. Photographs, diagrams. (F22)

96-F. On the Heterogeneities of Steel Forgings and the Resultant Mechanical Properties. Edward A. Loria. *Blast Furnace and Steel Plant,* v. 44, Mar. 1956, p. 315 + 6 p.

Ingot size and forging reduction, dendritic structure, banding and inclusions. Graphs, micrographs, diagram, table. 12 ref. (F22, N12, Q general, ST)

97-F. The Development of New and Unique Manufacturing Techniques for the Production of Passenger-Car Frames. Godfrey Burrows. *Engineering Journal,* v. 3, Mar.-Apr. 1956, p. 2-11.

Problems presented by new manufacturing techniques used to produce 1955 Chevrolet passenger car frame side rails. Each separate operation, from tube mill to bending, required special planning, design, and experimental processing. Photographs, diagrams. (F general, G general, T21)

98-F. Extrusion of Metals. G. A. Moudry. *Iron and Steel Engineer,* v. 33, Mar. 1956, p. 79-83.

Steel can be extruded at speeds much higher than aluminum, but at lower pressures. However, the extrusion temperature of steel is much higher about 2300° F., with far worse effects on the die blocks. Graphs, photographs. (F24, ST, Al)

99-F. (Czech.) **Laps in Rolled Material.** Zdenek Volf. *Hutnik,* v. 5, no. 11, Nov. 1955, p. 328-335.

Laps result from roll alignment and adjustment, improper heating, feed and other factors. Criteria for differentiating laps and seams from true cracks with similar surface appearance. Photographs, diagrams, micrographs. 7 ref. (F23, ST)

100-F. (English.) **4-High Reversing Cold Strip Mill and Its Electrical Equipment for Wide Steel Strips.** Hisao Kitsukawa, Hideyuki Yamamto, and Osamu Tazuke. *Hitachi Review,* 1955, no. 10, Oct. 1955, p. 3-14, 22.

Specifications for the rolling mill, problems involved in cold mill projects, data on electric drive equipment. Tables, photographs, diagrams, graphs. 17 ref. (F23, ST)

101-F. (French.) **Photographic Study of Rolling. Study of Deformation Between the Rolls of a Blooming Mill. Status of Research After the Photogrammetric Measurement Tests of December, 1954-January, 1955.** J. Stremsdoerfer. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 13, no. 1, 1956, p. 177-190.

Methods and equipment used in photogrammetric study of plastic deformation during rolling in a blooming mill. Diagrams, photographs, graphs. (F23, Q24, ST)

102-F. (French.) **The Forging of Hollow Pieces.** F. Guillemin. *Flamme et thermique,* v. 9, no. 88, Jan. 1956, p. 19-24, 33-42.

Treatment of pieces before forging, reheating, types of furnace, calamine, superheating of the steel, induction heating, surface improvement. Diagrams, photographs, graph. 13 ref. (F22, ST)

103-F. Improving Productivity in a Wire Mill. Charles C. Tappero. *American Iron and Steel Institute, Preprint,* 1955, 11 p.

Factors causing delays and suggested changes in equipment and handling methods to eliminate them; with special emphasis on helping operator to perform work faster and with less fatigue. Photographs. (F28)

104-F. (German.) **Method of Measuring the Wear in Wiredrawing With Drawing Dies Activated in the Atomic Pile.** Winfrid Dahl and Werner Lueg. *Stahl und Eisen,* v. 76, no. 5, Mar. 8, 1956, p. 257-261.

Testing methods, activation of the drawing dies, drawing tests, preparation of the solutions, measurement of the activity, autoradiographs. Example. Tables, diffractogram. 16 ref. (F28, Q9, S19)

105-F. (German.) **Forging and Drop-Pressing of Magnesium Alloys of Mg-Al-Zn Type.** Wilhelm Rosenkranz. *Zeitschrift für Metallkunde,* v. 47, no. 2, Feb. 1956, p. 107-117.

Influence of preliminary shaping temperature, working temperature and speed, and artificial aging on the properties of the forged and extruded alloys. Tables, graphs, diagrams, photographs. 1 ref. (F22, Q general, Mg, Al, Zn)

106-F. (German.) **Limits of Deformation in Extrusion Pressing.** Kurt Laue and Helmut Hornauer. *Zeitschrift für Metallkunde,* v. 47, no. 2, Feb. 1956, p. 117-121.

Factors which influence the process of deformation during impact extruding, giving a basis for calculating the most favorable conditions for deformation. Graphs, tables, diagrams. 4 ref. (F24, Al)

107-F. (Japanese.) **On the Λ Segregated Zone of Large Carbon Steel Ingots. III. Segregation Flaws Appearing in Large Carbon Steel Forgings.** Masayoshi Kawai. *Iron & Steel Institute of Japan, Journal,* v. 42, no. 2, Feb. 1956, p. 85-93.

Formation of flaws, relation between formation and manufacturing conditions. Micrographs, photographs. (F22, D9, CN)

108-F. (Japanese.) **Residual Stress in Cold Drawn Steel Tubings. II.** Hiroshi Imai. *Iron & Steel Institute of Japan, Journal,* v. 42, no. 2, Feb. 1956, p. 99-105.

Effects of die contour and reduction ratio on residual stresses. Diagrams, tables, graphs. 3 ref. (F26, Q25, ST)

G
Secondary Mechanical Working

141-G. Sandwich-Skin Construction in the Handley Page Herald. *Aircraft Production,* v. 18, Mar. 1956, p. 90-97.

Describes production of sandwich panels with unidirectional metal cores and panels of double curvature. Photographs, diagrams. (G general)

142-G. Stretch-Forming. *Aircraft Production,* v. 18, Mar. 1956, p. 106-111.

Description of the Hufford Carousel, a universal type of stretch-wrap forming machine which also does full-circle rotary forming, wipe forming, roll forming, reverse bends, joggling, stretch-levelling. Photographs, diagrams. (G9)

143-G. Machining Research. D. A. Oliver, T. S. Lister, M. D. Kinman and D. Fitzgeorge. *Aircraft Production,* v. 18, Mar. 1956, p. 118-124.

Mechanics of metalcutting and associated problems of temperature-rise and lubrication; machining problems in the aircraft industry; materials used in airframe manufacture; problems of machine tool design. Photograph, diagram, tables. 11 ref. (G17)

144-G. Save Four Ways: With Standardized Grinding Wheels. H. J. Prosser. *American Machinist,* v. 100, Feb. 27, 1956, p. 118-119.

How standardization of grinding wheels has been done and how it can be more widely applied. Photographs. (G18)

145-G. Epoxy Castings Replace Metal Forming Tools. Benjamin Sokol. *American Machinist,* v. 100, Feb. 27, 1956, p. 124-128.

Parting-agent problems that plague the epoxy-resin toolmaker are essentially solved by the use of a continuous film type of barrier coating. Tools and methods of fabrication outlined. Photographs, table. (G1)

146-G. Transfer Feeding Stampings. *Automation,* v. 3, Mar. 1956, p. 33-36.

Coil cradle, straightener, roll feed devices supply presses making refrigerator pans and shelves. Photographs, diagram. (G3)

147-G. Special Setup of Presses for Fender and Hood Production. Joseph Geschelin. *Automotive Industries,* v. 114, Mar. 1, 1956, p. 34-37, 90.

Extensive materials handling facilities at Chevrolet frame and stamping plant. Photographs. (G1, A5)

148-G. Automatic Control of Cutting Speed by the Temperature of the Cutting-Tool Edge. P. N. Malakhov. *Engineers' Digest,* v. 17, Jan. 1956, p. 13-14. (From *Vestnik Mashinostroyenya,* 1955, no. 4, Apr. 1955, p. 26-30.)

Previously abstracted from the original. See item 134-G, 1955. (G17, CI, ST)

149-G. Test Probe Limits of Controlled Shot Peening. Wesley W. Safee. *Iron Age,* v. 177, Mar. 1, 1956, p. 76-79.

Unanswered questions regarding effects of shot peening on fatigue life, and the "do's" and "don'ts" which permit more effective and more profitable operations. Graphs, table. (G23, Q7)

150-G. For Sheet Metal Fabricators —Cut Blanking Costs With Simplified Design. Frederico Strasser. *Iron Age,* v. 177, Mar. 15, 1956, p. 83-86.

Simple blank design provides a direct answer to how blanking costs can be effectively cut. Simplicity lowers tool costs, increases production, extends tool life. Diagrams. (G2)

151-G. Automated Stamping of Rear-Axle Housings. Charles H. Wick. *Machinery,* v. 62, Mar. 1956, p. 168-175.

Transfer presses with ingenious dies, automatic loading and unloading devices, interesting welding operations, latest type automation equipment lead to rapid, economical production. Photographs, diagrams. (G3, ST)

152-G. Rotary Cutters Used in Proto-Turning. *Machinery,* v. 62, Mar. 1956, p. 180-182.

Equipment and operations involved in production of odd-shaped aluminum parts in small quantities. Photographs. (G17, Al)

153-G. The Press Brake—Versatility Plus. Ernest C. Morse. *Modern Industrial Press,* v. 18, Feb. 1956, p. 24-26, 28.

Recent design improvements which increase versatility. Advantages and applications of press brake. Check list for prospective buyer. Photographs. (G3)

154-G. Techniques of Using Magnesium and Its Alloys in Sheet Form. R. G. Wilkinson. *Sheet Metal Industries,* v. 33, no. 346, Feb. 1956, p. 107-112; disc., 112-113.

Use of thick magnesium alloy sheet for aircraft parts usually made of aluminum. Methods of fabricating, advantages in weight and cost. Photographs, graph, diagram. (G4, T24, Mg)

155-G. Fuel-Tank Production at the Southall Works of A.E.C. Ltd. *Sheet Metal Industries,* v. 33, no. 346, Feb. 1956, p. 132-137.

Production of fuel tanks for commercial and passenger vehicles; a special-purpose press for an inverse flanging operation. Photographs, diagrams. (G1, A5, ST)

156-G. Shell Forming: Some Like It Hot, Some Like It Cold. Arthur F. MacConochie. *Steel,* v. 138, Feb. 27, 1956, p. 128-130, 132.

Comparison of cold forming and hot forging of ordnance shells. Features considered are lost steel, hot flow, cleanliness, work hardening, notch sensitivity, annealing, cold techniques, finishing. Hot-cupping, cold working process is suggested as best method. Diagrams, photograph. (G4, F22, ST)

157-G. Applying Cutting Fluids to Best Advantage. M. C. Shaw and P. A. Smith. *Tool Engineer,* v. 36, Mar. 1956, p. 111-115.

Methods and results of tests performed with cutting fluids in form of a flood of liquid and as a mist to determine relative efficiency of various methods of application. Graphs, diagram. (G21)

158-G. Diamond Tools Shape Small Parts. L. A. Hurwitz and R. A. Kurtz. *Tool Engineer,* v. 36, Mar. 1956, p. 116-119.

Selection, orientation, mounting, service life of diamond cutters; design of machines using diamond tools. Photographs. (G17)

159-G. Portable Tools in the Fabrication Shop. I. *Welding and Metal Fabrication,* v. 24, Feb. 1956, p. 40-44.

Review of modern portable tools, both electric and pneumatic, used in fabrication shops for grinding, sanding and polishing. Photographs. (G18, L10)

160-G. Soluble or Cutting Oil? *Automatic Machining,* v. 17, Mar. 1956, p. 39-42.

Advantages and disadvantages of each type and examples of applications for which each is best suited. (G21)

161-G. Cut Costs, Increase Production, by Platen Grinding With Abrasive Belts. John A. Simmons. *American Machinist,* v. 100, Mar. 26, 1956, p. 110-112.

A fast, efficient method of stock removal that gives a good finish on properly designed products and doesn't overheat the work. Table, photographs. (G18)

162-G. Fabrication of Zirconium Shells. II. R. S. French, C. H. Mayer and R. S. Pratt. *Bridgeport Brass Company, Bridgeport, Connecticut (U. S. Atomic Energy Commission),* SEP-149, March 1954, 35 p.

Metallurgical and mechanical property tests completed on two lots of alloy of the Zircalloy-I type and an additional lot of arc-melted sponge. Tables, graphs, micrographs, photographs. 8 ref. (G4, Q general, Zr)

163-G. The Machining Properties of Non-Ferrous Metals. D. F. Galloway. *Institute of Metals, Journal,* v. 84, Feb. 1956, p. 121-131 + 2 plates.

Techniques for solving machining problems and typical research results. Apparatus for measurement of cutting force and tool shape, factors influencing design of experiments. Graphs, diagrams, tables, photographs. (G17, Ni, Ti)

164-G. The Deep Drawing and Spinning of Sheet Metal, With Particular Reference to Non-Ferrous Materials. John A. Grainger. *Institute of Metals, Journal,* v. 84, Feb. 1956, p. 133-146 + 4 plates.

Recent developments in machines and methods, with particular attention to techniques such as marforming, hydroforming and flowturning, which provide inexpensive means of producing small quantities of parts. Lubrication discussed. Diagrams, graphs, tables, photographs. (G4, G13)

165-G. Rubber Pressing. J. Fielding. *Institute of Metals, Journal,* v. 84, Feb. 1956, p. 147-159 + 1 plate.

Methods and equipment for forming aluminum and magnesium alloys and titanium, details of hot-pressing techniques, with special reference to materials, temperatures, pressures and heat resisting rubbers. Tables, graphs, diagrams, photographs. 10 ref. (G8, Mg, Al, Ti)

166-G. How to Get More for Your Metalworking Dollar. II. How to Get More for Your Tooling Dollar. *Iron Age,* v. 177, Mar. 8, 1956, p. 153-184.

Contributions by the country's top tooling men, on metalworking problems and economics, range from the fundamentals of part design to the actual selection of equipment and accessories. The material is divided into two parts: tooling factors; and up-to-date editions of toolsteel charts. Photographs, tables. (G general, T6, TS)

167-G. (Czech.) **Importance of Cold Pressing as a Method for Manufacturing Screws and Bolts.** Karel Cerny. *Hutnik,* v. 5, no. 11, Nov. 1955, p. 337-340.

Techniques and machines for new method of making bolts and its economy compared with older machining methods. Diagrams, graph, photograph. 3 ref. (G1)

168-G. (Czech.) **Broaching and the Manufacture of Broaches.** J. Kryslicka. *Strojirenska Vyroba,* v. 3, no. 11, Nov. 1955, p. 456-457.

Materials, design, methods of preparation and operational features. Photographs. (G17, TS)

169-G. (French.) **Relationship Between Hardness and Extrusion Effort in the Impact Extrusion of Light Metals.** Robert Chopin and Jacques Chopin. *Revue de l'Aluminium,* v. 32, no. 227, Dec. 1955, p. 1150-1154.

Strain gage measurements of pressures exerted on a punch at the time of the extrusion show the extrusion capacity of a press by reference to its checked performance on 99.5% aluminium. Tables, graphs, diagrams. (G5, Q29, Q25, Al)

170-G. (Italian.) **Pressworking of Light-Alloy Containers.** A. Rossi. *Alluminio,* v. 25, no. 1, Jan. 1956, p. 5-11; disc., p. 12.

Illustrates various production methods such as deep-drawing, extrusion, ironing and the Keller-method. Fabrication processes for milk cans, gas cylinders, kitchen utensils for electric stoves. Diagrams, photographs, table. (G1, Al)

171-G. (Russian.) **Machinability of Stainless Steel.** Ia. Kh. Kostiukov. *Vestnik mashinostroeniia,* v. 36, no. 1, Jan. 1956, p. 38-42.

Properties of steel to be machined, machine tools and equipment used; choice of optimum geometry of cutter; deformation of layer subjected to cutting, and of machined surface; cutting speed permitted by a given cutting tool. Graphs, table. 2 ref. (G17, SS)

172-G. (Russian.) **Cold Stamping of Steel Parts.** V. A. Popov and A. N. Mit'kin. *Vestnik mashinostroeniia,* v. 36, no. 1, Jan. 1956, p. 50-54.

Stamping forces and other elements of stamping process analyzed. Design and materials in stamp dies; strength and quality of surface of the stamped parts. Diagrams, photographs, graph, table. (G3, ST)

173-G. (German.) **Electro-Erosive Machining of Metals.** H. Opitz. *Schweizer Archiv für Angewandte Wissenschaft und Technik,* v. 22, no. 2, Feb. 1956, p. 41-47.

Process, machinery, effectiveness, exactness and possibilities. Graphs, diagrams, photographs, oscillograms. 3 ref. (G17)

174-G. (German.) **Effect of Heat Treatment on the Machinability in Turning and Drilling of Plain Carbon Steel Containing About 0.45% C With Due Consideration of the Steel Melting Methods Used.** Egon Koerfer, Hermann Schenck and Hans-Kurt Görlich. *Stahl und Eisen,* v. 76, no. 3, Feb. 9, 1956, p. 125-133.

Investigations were made with bars of openhearth, electric furnace, improved converter and basic converter steels. Diagrams, micrographs, graphs, tables. (G17, J general, ST)

H

Powder Metallurgy

56-H. The Powder Metallurgy of Titanium. D. A. Robins. *Light Metals,* v. 19 Feb. 1956, p. 60-63.

Types of powder; pressing and sintering; properties and applications. Diagram, tables, photographs. 10 ref. (H general, Ti)

57-H. Here's How Powdered Metallurgy Can Save You Money. II. The Application, Advantages and Limitations of Powdered Metallurgy. Samuel Bradburg, III, and George Karian. *Machine and Tool Blue Book,* v. 51, Mar. 1956, p. 121-130.

Advantages are low material waste, low tooling and production costs, high production rates, wide range of physical properties, production of parts not possible by other methods. Includes limitations to design and size of parts and a chart of compositions, their properties and uses. Tables, diagrams, graphs. (H general)

58-H. Powder Metallurgy Permits Air Cooling of Turbine Blades. R. W. A. Buswell, I. Jenkins and E. R. Perry. *Metal Progress,* v. 69, Mar. 1956, p. 52-56.

Practical solution to operating engines with gas at over 2000° F. was developed in England. Matrices of many tiny cooling passages are formed in metallic blades and vanes by volatile cores properly placed in powder metal pressings. Photographs, graphs, micrographs, tables. (H general T25 SG-h, Co)

59-H. The Powder Metallurgy of Zirconium-Tin Alloys. I. Henry H. Hausner and Richard M. Treco. *Sylvania Electric Products, Inc. (U. S. Atomic Energy Commission),* SEP-85, Feb. 1952, 21 p.

Feasibility of manufacturing zirconium-tin alloys by powder metallurgical methods. Corrosion rates and other physical properties of various alloys. Results from crystal bar zirconium compared with those from zirconium sponge. Graphs, micrographs, tables. (H general, R general, EG-d)

60-H. (Italian.) **Copper-Beryllium Sintering.** G. Venturello and L. Donadio. *Metallurgia Italiana,* v. 47, Special Supplement to No. 12, Dec. 1955, p. 3-10; disc. p. 10.

Preparation of 2% beryllium alloy by sintering. Best results achieved at pressure of 10 tons per sq.cm. and sintering at 840° C. for 8 hr. Graphs, micrographs, tables. 10 ref. (H15, Be, Cu)

61-H. (Italian.) **Contribution to Copper Sintering.** A. Bia. *Metallurgia Italiana,* v. 47, Special Supplement to No. 12, Dec. 1955, p. 13-14; disc., p. 14.

Investigation of sintering between 0.5 and 1.5 hr. at temperatures from 850 to 1050° C. Graphs. (H15, Cu)

62-H. (Italian.) **Sintered Metal Parts as Babbitts.** P. Pensa. *Metallurgia Italiana,* v. 47, Special Supplement to No. 12, Dec. 1955, p. 17-21; disc., p. 21.

Compositions, industrial processing, applications, market conditions. Diagrams, micrographs, photograph, graphs. 8 ref. (H general, SG-c)

63-H. (Italian.) **On Some Electric Sintering Furnaces.** O. Dorigo. *Metallurgia Italiana,* v. 47, Special Supplement to No. 12, Dec. 1955, p. 23-25; disc., p. 25.

Brief report on 11 European companies; various types of furnaces for refractory materials, hard alloys, iron sintering and bronze sintering. Diagrams. (H15, W, Mo, Fe, Cu)

64-H. (Russian.) **Effect of Impregnation on the Compressive Strength of Porous Iron.** V. G. Filimonov. *Vestnik mashinostroeniia,* v. 36, no. 1, Jan. 1956, p. 57-58.

Relation between strength of powder metal part during machining and the consistency and viscosity of the oils, or other lubricants, in the pores. Impregnation affects tensile strength only slightly. Tables, graph. (H16, Q28, Fe)

65-H. Production of Borides of High-Melting Metals at Elevated Temperature in Vacuum. G. A. Meerson and G. V. Samsonov. *Henry Brutcher Translation No.* 3658, 9 p. (Abridged from *Zhurnal Prikladnoi Khimii SSSR,* v. 27, no. 10, 1954, p. 1115-1120.) Henry Brutcher, Altadena, Calif.

Procedure for preparing borides of titanium, vanadium, columbium, zirconium, tantalum and tungsten by reaction of the metal oxides with boron carbide and carbon black. Tables, graph, diagrams. 4 ref. (H10, Ti, V, Cb, Zr, Ta, W)

66-H. Compressibility of Powders of Borides, Carbides, and Nitrides of High-Melting Metals. G. V. Samsonov and V. S. Neshpor. *Henry Brutcher Translation No.* 3661, 7 p. (From *Doklady Akademii Nauk SSSR,* v. 104, no. 3, 1955, p. 405-408.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 9-H, 1956. (H11, Ti, Zr, W)

67-H. (Dutch.) **Copper and Copper Alloys. XV. Powder Metallurgy in Its Special Application to Copper and Copper Alloys.** W. R. G. de Jager. *Metalen,* v. 11, no. 3, Feb. 15, 1956, p. 62-64.

Production of powders. (To be continued.) Micrographs. 3 ref. (H10, Cu)

68-H. (German.) **Powdered Materials Prepared From Aluminum.** Günter Wassermann and Richard Weber. *Zeitschrift für Metallkunde,* v. 47, no. 2, Feb. 1956, p. 74-78.

Appropriate processing methods of impact extruding, drop forging, rolling and die-pressing. Tables, photographs, micrograph. 11 ref. (H14, Al)

69-H. (Pamphlet.) **Powder Metallurgy —Now (New Techniques, Improved Properties, Wider Use).** F. V. Lenel. Fifty-Eighth Annual Meeting, American Society For Testing Materials, H. W. Gillett Memorial Lecture. 34 p. 1955.

Mechanical properties of structural parts, some recently developed techniques for making semifabricated products from powder, role of powder metallurgy in development of high-temperature materials. Graphs, photographs, tables, diagram. 32 ref. (H general)

J

Heat Treatment

106-J. Principles of Heat Treatment of Steels. R. Smith. *Australasian Engineer,* Jan. 1956, p. 61-71.

Basic principles, with particular attention to phase transformations. Discussion of microstructures produced, their formation and properties. Graphs, diagrams, micrographs, table. 19 ref. (J general, M27, CN)

107-J. Heat Transfer in Industrial Heating Furnaces. III. M. H. Mawhinney. *Industrial Heating,* v. 23, Feb. 1956 p. 292 + 7 pages.

Use of curves establishing relation between ratio of heat flow to hearth surface area and ratio of area of heated surface to that of refractories for calculating heat transfer. Graphs, tables. (J general)

108-J. Preheating and Postheating Problems in Repair of Heavy Steel Castings. Charles Berka. *Industry & Welding,* v. 29, Mar. 1956, p. 44-46, 49, 102.

Steps necessary to prepare damaged castings for arc welding; welding method and postheating and cooling. Photographs. (J1, K1, CI)

109-J. Engineered Heat Treating Equipment—A Key to Improved Metallurgical Products. R. W. Brown. *Industrial Heating,* v. 23, Feb. 1956, p. 240-242, 244, 246.

Special furnaces designed to insure consistent and exact conditions necessary for creating maximum alloy properties. Photographs. (J general)

110-J. Application of Electronic Induction Heating Equipment. I. H. G. Carlson. *Industrial Heating,* v. 23, Feb. 1956, p. 250 + 8 pages.

Some fundamentals of work coil design and determination of power requirement. Diagrams, tables, graphs. (To be continued.) (J2)

111-J. New Annealing Facilities for Ford Motor Co.'s Steel Division. John H. Sprague. *Iron and Steel Engineer,* v. 33, Feb. 1956, p. 101-105.

Installation of modern facilities for annealing cold rolled sheets. Photographs, graphs. (J23)

112-J. The Heat-Treatment of Carbon Tool Steels. A. G. Gardner. *Machinery,* v. 88, Feb. 1956, p. 276-278.

Annealing, stress relieving, hardening and tempering of steels with varying carbon content. Graph, tables. (J general, TS)

113-J. Induction Hardening. II. D. Warburton Brown. *Machinery Lloyd (Overseas Ed.)* v. 28, Feb. 4, 1956, p. 69-71, 73-74.

Progressive heating process and metallurgical considerations involved in induction hardening. Diagrams, graph. (J2, ST)

114-J. Selection and Application of Furnace Atmospheres for Carbon Control. O. E. Cullen. *Metal Progress,* v. 69, Mar. 1956, p. 57-61.

Furnace atmosphere containing about 20% carbon monoxide, 40% hydrogen and 40% nitrogen can be used to carburize, carbo-nitride, recarburize decarburized surfaces, clean, harden or increase the carbon content of strip to a uniform higher level. Requires careful measurement and control of dew point. Diagram, graph, table, photographs. (J2, CN)

115-J. Production Control of Salt Baths in Germany. Otto Schaaber. *Metal Progress,* v. 69, Mar. 1956, p. 67-71.

Potential of bath is measured by immersing mild steel foil long enough to carburize throughout, and estimating carbon content. Quenching power of martempering is measured by time needed to heat a small cylinder through a specified range. Graph, photographs, diagram, table. (J2)

116-J. Application of X-Rays to the Heat Treating Industry. Robert E. Ogilvie. *Metal Treating,* v. 7, Jan.-Feb. 1956, p. 2-5.

Applications of X-ray fluorescent analysis for determining elements

present and X-ray diffraction analysis for determining phases present. Graphs, diagram, photographs. (J general, M22, S11)

117-J. Heat Treating Aircraft Fasteners. Thomas A. Dickinson. *Metal Treating,* v. 7, Jan.-Feb. 1956, p. 6-7.

Dual heat treating setup enables threaded fasteners to be hardened and tempered in such a manner that parts undergo negligible dimensional changes and require a minimum of cleaning prior to electroplating. Photographs, diagram. (J26, J29, L17, ST)

118-J. Heat-Treatment of Titanium-Manganese Alloys. A. Saulnier. *Metal Treatment and Drop Forging,* v. 23, Feb. 1956, p. 63-66.

Summary of recent French research on structural transformations of titanium-alloys with 7% Mn and with 4% Mn and 4% Al. Graph, micrographs. (J26, J29, N6, Ti, Mn)

119-J. Scale-Free Heating in a Direct-Fired Furnace. Horace Drever. *Steel,* v. 138, Mar. 5, 1956, p. 105-106.

Principles of the Equiverse furnace where the burners which do the heating also create a scale-free atmosphere when operating up to 2350° F. Photograph, graphs. (J2, ST)

120-J. Controlled Low-Temperature Stress Relieving of Pressure Vessels. T. W. Greene and C. R. McKinsey. *Welding Journal,* v. 35, Mar. 1956, p. 145s-152s.

Tests indicate that controlled low-temperature stress-relieving process is a practical method of stress-relieving large structures, field erected tanks and final assembly welds of pressure vessels. Graphs, diagrams, photographs, tables. 4 ref. (J1, ST)

121-J. (German.) **Removal of Carbon From Over-Saturated Solutions in α-Steel During Precipitation.** Wolfgang Pitsch and Kurt Lücke. *Archiv für das Eisenhüttenwesen,* v. 27, no. 1, Jan. 1956, p. 45-54.

Attenuation and electric resistance dependence of over-saturated and of precipitated carbon in alpha steel. Separation course at 90 to 70° C. in deformed and nondeformed wires, after quenching at 710° C. Graphs, tables, diagram 28 ref. (J26, N8, ST)

122-J. (German.) **Investigation of Usefulness of Sulfite-Cellulose Liquor as a Cooling Agent in Heat Treatment of Steel.** R. Mitsche and E. Bierbrauer. *Berg- und hüttenmännische monatshefte der monanistischen Hochschule in Leoben,* v. 101, no. 1, Jan. 1956, p. 12-18.

Especially applicable in the case of construction steels. Tables, graphs. 2 ref. (J2, ST)

123-J. (Russian.) **Low-Temperature Tempering of Wire for Prestressed Concrete and Cables.** L. V. Beloruchev. *Stal',* v. 16, no. 1, Jan. 1956, p. 56-62.

Tempering procedure results in improved mechanical properties, including resistance to relaxation of stresses, and the elimination of stresses leading to the untwisting of cables. Tables, graphs. 8 ref. (J29, ST)

124-J. Experimental Investigation of Low-Temperature Stress-Relieving Methods Applied to Penstocks. Minoru Okada and Masaki Watanabe. *British Welding Journal,* v. 3, Mar. 1956, p. 788-83.

Experimental investigation of the application of low-temperature stress-relieving methods to penstocks. Part of a larger project designed to produce a standard code for welded penstocks. Diagrams, graphs. (J1, Q25)

125-J. Practical Hints on the Annealing of Strip Steel. A. E. Nygren. *Henry Brutcher Translation No.* 3660, 8 p. (Condensed from *Värml. Bergsm. Fören. Annaler,* 1953, p. 108-137.) Henry Brutcher, Altadena, Calif.

Hardness as function of time of annealing hypo and hypereutectoid steels at different temperatures; effects of spheroidizing temperature and cooling rate. Table, graphs. (J23, ST)

126-J. (German.) **Inductive Surface Quenching of Nodular Cast Iron.** Wener Malmberg. *Giesserei,* v. 43, no. 4, Feb. 16, 1956, p. 81-85.

Types of induction heating, quenching experiments with pearlite and ferrite irons. Graphs, micrographs. 6 ref. (J26, J2, CI)

K Joining

185-K. Role of Surface Energies and Wetting in Metal-Ceramic Sealing. W. D. Kingery. *American Ceramic Society Bulletin,* v. 35, Mar. 1956, p. 108-112.

Determination of wetting behavior by surface and interface energies; relationship of surface energy, wetting properties, metal-ceramic sealing process. Diagrams, table. 14 ref. (K11, P10)

186-K. Trends in Design of Ceramic-to-Metal Seals for Magnetrons. Leo J. Cronin. *American Ceramic Society Bulletin,* v. 35, Mar. 1956, p. 113-116.

Transition from glass through glass-bonded ceramics to ceramic-to-metal seals; specific test for evaluation of ceramics and their bonding strength; stress-strain relationships. Diagram, graphs, photographs, table. (K11)

187-K. Applying a Semi-Automatic Welding Process in the Maintenance Field in the Copper Smelting & Refining Industry. J. Hallenan. *Australasian Engineer,* Jan. 1956, p. 53-57.

Examples showing value of a semi-automatic welding machine for maintenance work. Diagrams. (K1, C21, ST, Cu)

188-K. Techniques for Inert Arc Welding Heavy Aluminum Plate. J. A. Gowen. *Industry & Welding,* v. 29, Mar. 1956, p. 54-56, 71.

Process used for aluminum welds as long as 15 ft., maintaining rigid Navy specifications. Weld deposits are so smooth no finishing grinding is required. Photographs. (K1, G18, Al)

189-K. Ceramic Fixtures Are Key to "Brazing by Automation". *Industry & Welding,* v. 29, Mar. 1956, p. 62 + 6 p.

Problems causing high costs of conventional production brazing. Advantages of ceramic fixtures. Tables, photographs, diagram. (K8)

190-K. "Cold Weld" Nickel Alloys for Atom Plant Use. E. Nutter. *Iron Age,* v. 177, Feb. 16, 1956, p. 111-113.

An inert-gas arc welding technique which insures sound, pore-free joints in a nickel alloy pump; process features low temperatures, an argon gas shield and multiple passes with small diameter rod. Diagrams, photographs. (K1, Ni)

191-K. Fluxless Aluminum Joining Avoids Joint Corrosion. Samuel Freedman. *Iron Age,* v. 177, Mar. 1, 1956, p. 71-73.

Recently developed self-fluxing aluminum solder joins easily and economically at low temperature. Presence of aluminum oxide surface film can be ignored. Compatible zinc-lead blend bonds securely with parent metal. Table, micrograph, photograph. (K7, Al, Zn, Pb)

192-K. Pushbutton Setup Welds Aluminum Tubing Joints. Robert Loose. *Iron Age,* v. 177, Mar. 1, 1956, p. 80-81.

In evaporator assemblies for refrigerators, aluminum coils are brazed to aluminum sheet. Connection of the pipes extending from the coil to the remainder of the system is done, in part, by Heliarc welding of aluminum-to-aluminum joints and by silver brazing copper joints. Circular welds are produced in two ways. Photographs. (K1, K8, Al, Cu)

193-K. High-Speed Welder Tests Own Joints. Glen Farrington. *Iron Age,* v. 177, Mar. 15, 1956, p. 96-97.

Soon to be installed welder will test its own joints to a 4000-lb. pull at 800 per hr. Flanged rods are automatically weld fabricated from stamped washers and thick coil stock. Photographs. (K3)

194-K. Engineering for You and Me. II. Strength, Fatigue, Failure in Fasteners. Harry Conn. *Machine and Tool Blue Book,* v. 51, Mar. 1956, p. 105 + 12 pages.

Mechanical, physical, chemical properties of metals; factors that cause failures in dynamically stressed parts. Tables, graphs, diagrams. 3 ref. (K13)

195-K. Manufacture of Spot Welded Automobile Wheels. Milton H. Grams. *Metal Progress,* v. 69, Mar. 1956, p. 63-67.

Replacing of riveting lines by four-gun spot welding machines relieved bottleneck in production of automobile wheels. Welded wheels are stronger and can be assembled automatically with greater control of quality. Photographs. (K3)

196-K. Room-Temperature Bonding. Jerome L. Been. *Modern Plastics,* v. 33, Mar. 1956, p. 126 + 6 pages.

New high-strength fastening possibilities for plastics and other components. Photographs, graphs. (K12)

197-K. The Use and Welding of Aluminium in Shipbuilding. N. T. Burgess. *Sheet Metal Industries,* v. 33, no. 346, Feb. 1956, p. 138-141.

Short review of inert-gas methods, welding aluminum-magnesium alloys, self-adjusting arc welding, radiography of welds, training of welders, materials and design, filler alloys, testing of welded aluminum structures. (K1, T22, Al, Mg)

198-K. How Tight Is Tight? Charles W. Quillen. *Steel,* v. 138, Feb. 27, 1956, p. 114-115.

Stall-type pneumatic tools are used to tighten nuts and bolts automatically. Operator needs only to check air pressure and bring tool to a complete stall. Photographs. (K13)

199-K. Brazing With Silver Alloys. Allen W. Swift. *Tool Engineer,* v. 36, Mar. 1956, p. 91-95.

Case histories of four representative problems of production requirements: precision brazing; fixtures for high production; odd joint angles; hard-to-handle tubing and castings. Photographs, diagram. (K8, Ag)

200-K. Automatic Butt Welding of High Pressure Pipes. *Welding and Metal Fabrication,* v. 24, Feb. 1956, p. 56-58.

Consists of bringing the faces to be joined together under a minor

load and heating by means of a multi-jet oxy-acetylene oscillating ring burner until a pre-set thermal expansion is reached. A second higher or control load is then applied to return the pipe to its original length, when the final butting pressure operates to complete the weld. Diagram, micrograph, photographs. (K2)

201-K. The Welding of Clad Steels. II. J. Hinde. *Welding and Metal Fabrication,* v. 24, Feb. 1956, p. 59-62.

Procedures for welding of clad steels, including Monel, Inconel, austenitic stainless, plain chromium stainless, and nickel. Tables, diagrams, photographs. 16 ref. (K1, L22, Ni, ST)

202-K. High Speed Welding of Steel Compressor Cases. C. F. Stephenson and R. A. Stone. *Welding Journal* v. 35, Feb. 1956, p. 113-121.

Successful application of inert-gas metal-arc welding to the production of a hermetic line of compressors for room air conditioners and refrigeration. Tables, diagrams, photographs. (K1)

203-K. Welding of High-Temperature High-Pressure Piping With Chrome-Moly Electrodes. Lloyd C. Nesbitt. *Welding Journal,* v. 35, Feb. 1956, p. 129-135.

Chrome-Moly E-XX15 low-carbon, low-hydrogen electrodes have been developed to produce satisfactory welds on ferritic chromium-molybdenum steels. Photographs, graph, tables, micrographs. 2 ref. (K1, AY)

204-K. Mechanized Brazing of Fan Components. Frank G. Leuthner. *Welding Journal,* v. 35, Feb. 1956, p. 136-141.

Large savings are realized with unique semi-automatic brazing method using a powdered filler metal and the proper flux. Photographs, tables. (K8, Ag)

205-K. Characteristics of a Rectifier-Type Constant-Voltage Power Supply. J. W. Pomazal. *Welding Journal,* v. 35, Feb. 1956, p. 142-144.

Principle of operation, characteristics of a rectifier power supply of the type being used in multiple-operator welding installations. Photograph, diagrams, graph, table. (K1)

206-K. The Carbon-Dioxide-Shielded Metal-Arc Welding Process. R. J. Keller and J. Koss. *Welding Journal,* v. 35, Feb. 1956, p. 145-151.

High potential for welding cost reduction and excellent weld metal quality are advantages claimed for this process. Photographs, graph, tables. (K1)

207-K. A Test Block for Welding Gray and Nodular Cast Irons. Willerd A. Schumbacker and Anton L. Schaeffler. *Welding Journal,* v. 35, Feb. 1956, p. 91S-97S; disc., 97S-99S.

Simple test developed to discriminate between the many welding procedures and filler metals available for welding gray and nodular castings. Photograph, diagrams, tables, micrographs. (K9, CI)

208-K. Effect of Current and Atmospheres on Arc Temperatures. G. M. Gordon, Olga A. Cotter and E. R. Parker. *Welding Journal,* v. 35, Feb. 1956, p. 109S-112S.

Problems involved in measuring and mapping the temperatures in the arc stream and early progress made on this project. Tables, graphs, spectrum. 8 ref. (K1)

209-K. The Application of Welding in Japanese Hydro-Electric Projects. Teikichi Kamiya and Toshie Okumura. *British Welding Journal,* v. 3, Mar. 1956, p. 83-89.

Development and use of welding for steel penstocks, surge tanks, turbine casings and vortex rings. The steel plates used for penstocks and turbine components are tending to become thicker as the capacity of power plants increases. The use of local field annealing for thick steel plates described. Photographs, diagrams, graph, tables. (K1, K2, J1, ST)

210-K. The Weldability and Mechanical Properties of a Series of Mn-Ni-Cr-Mo Steels. C. L. M. Cottrell, B. J. Bradstreet and T. E. M. Jones. *British Welding Journal,* v. 3, Mar. 1956, p. 90-98 + 2 plates.

A series of experimental low alloy steels have been examined for hard-zone crack sensitivity by the controlled thermal severity (C.T.S.) test. C.T.S. tests were carried out using low-hydrogen metal arc-welding electrodes. Estimates made of safe upper limit of hardness in the heat affected zone to avoid cracks when welding low alloy steels with low-hydrogen electrodes. Tables, diagram, graphs. 6 ref. (K9, Q29, AY)

211-K. A Review of Literature on the Causes of Porosity in Steel Welds. A. R. Muir. *British Welding Journal,* v. 3, Mar. 1956, p. 98-102.

Occurrence of porosity in steel weld metal considered in light of present-day knowledge. It is thought that gas evolution may be due to solubility changes or chemical reactions. The methods of entry of soluble gases into the weld have been considered and it is thought that entry may be achieved by primary solution in the welding slag and partition between this and the weld metal. Tables. 31 ref. (K9, ST)

212-K. Propane and Metalworking. Sidney Smith. *Canadian Metals,* v. 19, Feb. 1956, p. 20 + 4 pages.

Applications and proper usage of propane in metalworking industry. Diagrams, photographs, table. (K2, G22)

213-K. Arc Welding in the Petroleum Industry. K. D. Taylor. *Canadian Metals,* v. 19, Feb. 1956, p. 29-30.

A brief discussion of welding low-alloy piping, stainless steels, and carbon steels, particularly for low-temperature service. (K1, ST)

214-K. How to Weld Zirconium. Hugh Justis and Chester Lawrence. *Iron Age,* v. 177, Mar. 22, 1956, p. 79-81.

Fusion and resistance welding techniques. Fusion welding requires inert atmosphere. Tables, photographs, micrograph. (K1, K3, Zr)

215-K. Brazing Catches Up. *Steel,* v. 138, Mar. 26, 1956, p. 126-129.

Details, advantages, recent applications. Photographs. (K8)

216-K. Arc-Welding Titanium. J. C. Barrett, R. W. Huber and I. R. Lane, Jr. *U. S. Bureau of Mines, Report of Investigations* 5178, Jan. 1956, 50 p.

Resume of experiments conducted by Bureau of Mines since 1948 demonstrates that process is successful if conducted under proper conditions. Includes welding of prototypes. Photographs, micrographs, tables, graphs. 10 ref. (K1, Ti)

217-K. Control of Welding for Jet Engine Canware. R. Bushell. *Welding and Metal Fabrication,* v. 24, Mar. 1956, p. 76-85.

Precautions and considerations necessary in modern aircraft fabrication. Diagrams, photographs. (K1)

218-K. The Welding of Galvanized Steel. A Review of Recent Literature. P. W. Jones. *Welding and Metal Fabrication,* v. 24, Mar. 1956, p. 98-101.

Notes lack of information on arc-weld strength. Fumes and hygiene considered. 48 ref. (K1, L16, A7)

219-K. Permeability and Crack Sensitivity of Stainless Welds. John L. Lang and Charles Wright. *Welding Journal,* v. 35, Mar. 1956, p. 225-228.

Base metal Types 302 and 304 and methods of evaluation. Shop practices utilizing manual, submerged-arc and consumable electrode inert-gas-shielded arc welding of Types 302 and 304 stainless steel crankcases and flywheels. Photographs, graphs, tables, diagrams. (K1, SS)

220-K. The Development and Investigation of High-Tensile High-Impact Electrodes. G. S. Wepfer. *Welding Journal,* v. 35, Mar. 1956, p. 229-235.

An electrode was developed that can be classified as an E11015-type with a chemical analysis of 3.50% nickel and 0.50% molybdenum. This electrode has a yield strength of 95,000 psi. and a tensile strength of 110,000 psi. in either the as-welded or stress-relieved conditions. The weld metal does not become embrittled when stress relieved and the impact properties are very good at both normal and subzero temperatures. Photograph, tables, diagrams. (K1, Q23, T5)

221-K. Transient Problems With High-Flux Density Transformers in Welding Applications. R. C. Mierendorf. *Welding Journal,* v. 35, Mar. 1956, p. 236-242; disc., p. 243.

Magnetizing transients may be successfully predicted when the characteristics of the welding transformer are available and the power factor of the welding transformer itself will determine the optimum initiation angle. Photograph, graphs. 3 ref. (K1, K3)

222-K. A New Approach to the Automatic Welding of Alloy Steels. Emmett Smith and Paul Jerabek. *Welding Journal,* v. 35, Mar. 1956, p. 244-247.

Many new possibilities are opened by using alloy fluxes with mild-steel electrodes or modifying weld deposits where standard available electrode compositions are used. Photographs, graph, tables, diagram. (K1, AY)

223-K. Effect of Individual Coating Ingredients on Surface Tension of Iron Electrodes. Thomas H. Hazlett and Earl R. Parker. *Welding Journal,* v. 35, Mar. 1956, p. 113s-114s.

Coating materials found to reduce the surface tension considerably below the value for the bare electrode. Diagrams, photograph, table. 2 ref. (K1, P10, T5, Fe)

224-K. Optimum Spot and Seam Welding Conditions for Inconel "W". Ernest F. Nippes, Warren F. Savage and Khosrow L. Moazed. *Welding Journal,* v. 35, Mar. 1956, p. 127s-136s.

Results of research investigation indicate that the optimum conditions for spot and seam welding Inconel W are much the same as those for Inconel X. Tables, photographs, diagrams, graphs, micrographs. 7 ref. (K3, Ni)

225-K. Welding of High-Strength Stainless Steels for Elevated-Temperature Use. J. J. Vagi and D. C. Martin. *Welding Journal,* v. 35, Mar. 1956, p. 137s-144s.

Several high-strength stainless steels were found to be weldable under conditions of high restraint using the inert-gas-shielded tungsten-arc process. Tables, diagrams, photograph, micrographs. (K1, SS)

226-K. Analysis of the Direct-Current Arc. Alan D. Morris and Willis

C. Gore. *Welding Journal,* v. 35, Mar. 1956, p. 153s-160s.

Mechanism of power transfer to the anode, the formation and extent of the cathode region and the power dispersal in the arc are some of the phenomena which are evaluated and discussed. Photographs, tables, graphs, diagram. 38 ref. (K1)

227-K. (German.) **Light-Weight Construction of Welded Generators for Hydroelectric Power Stations.** G. Barby and R. Simon. *Schweissen und Schneiden,* v. 8, no. 1, Jan. 1956, p. 9-14.

Welding process in construction of beams and parts of hydroelectro generators. Diagrams, photographs, graph. (K general, ST)

228-K. (German.) **Welding of Hydroelectric Station Machinery and Electrical Equipment.** S. Malamet. *Schweissen und Schneiden,* v. 8, no. 1, Jan. 1956, p. 19-26.

Basic problems of welding in construction of parts of hydropower station equipment, according to data from experience. Photographs, graph, diagrams. (K general, ST)

229-K. (German.) **New Austrian Penstocks and Pressure Shafts.** Ernst Chwalla. *Schweisstechnik,* v. 9, no. 12, Dec. 1955, p. 133-136.

Welding procedure for hydropower station water pipes. Photographs. (K general, ST)

230-K. (Russian.) **Cold Electro Welding of Cast Iron.** A. E. Asnis and Iu. V. Latash. *Liteinoe Proizvodstvo,* 1956, no. 1, Jan. 1956, p. 6-8.

Welding with different types of electrodes. Diagrams photographs, micrographs. 9 ref. (K1, CI)

231-K. The Arc Welding of Aluminum. *Aluminium Development Association, Information Bulletin No.* 19, Dec. 1955, 92 p.

Descriptions and operating data for all the electric arc welding processes, with particular attention to inert-gas shielded-arc processes. Diagrams, tables, photographs. (K1, Al)

232-K. On the Nature of Intergranular Cracking of Welds at High Temperature. B. A. Movchan and L. A. Poznyak. *Henry Brutcher Translation No.* 3572, 19 p. (Abridged from *Avtomaticheskaya Svarka,* v. 8, no. 6, 1954, p. 59-72.) Henry Brutcher, Altadena, Calif.

Experiments on mechanism of intergranular fracture and on crystallization of chemically heterogeneous alloys, based on microradiography and X-ray diffraction. Chemical heterogeneity of columnar crystallites as a main factor inducing hot cracking; effect of weld metal and flux. Graph, photograph, micrographs, microradiographs, X-ray diffractograms. 27 ref. (K9, N12, SS)

233-K. (German.) **Tests on Cone Fastening of Aluminum and Steel.** Wilhelm Hofmann and Gerhard Kornberger. *Zeitschrift für Metallkunde,* v. 47, no. 2, Feb. 1956, p. 86-89.

The best bonding with cones of soft steel driven into aluminum was obtained with cones having a silver or zinc coating. Graphs, diagrams. 1 ref. (K13, K4, Al, ST)

234-K. (Russian.) **Argon-Arc-Welding of High-Alloy Pipes.** A. T. Koniushenko, A. S. Iuzefovich, E. I. Bashkirova, F. V. Karamyshev, F. B. Diatlov and E. N. Khoroshev. *Stal',* v. 16, no. 2, Feb. 1956, p. 151-155.

Continuous method of welding pipes of different types of steel in which the welded joint strength is close to the strength of the base metal, without the use of any thermal treatment. Tables, graph, diagram, photographs, micrographs. (K1, AY)

235-K. (Russian.) **Effect of Nonfusions of Butt Welds of Steels 40 Kh and 55 on the Mechanical Properties of Welded Joints.** G. I. Pogodin-Alekseev and M. S. Savel'eva. *Svarochnoe Proizvodstvo,* 1956, no. 2, Feb. 1956, p. 1-4.

Improvement of strength and plastic characteristics of welded seams through heat treatment. Variation of notch toughness in relation to the size of the unfused zone. Effect of composition of steel and weld metal. Table, graphs, diagrams. 2 ref. (K3, Q23, CN)

236-K. (Russian.) **Choice of Methods for Testing Structural Steel for Weldability.** A. I. Krasovskii. *Svarochnoe Proizvodstvo,* 1956, no. 2, Feb. 1956, p. 6-13.

Testing methods (bending, impact and testing machines) in relation to main properties (strength and plasticity) of welded seams; conditions of use. Tables. 28 ref. (K9, Q23, CN)

237-K. (Book.) **Brazing Alcoa Aluminum.** 134 p. 1955. Aluminum Co. of America. Pittsburgh, Pa.

Practical shop data on brazing methods; effect of current knowledge of brazing processes on design. (K8, Al)

L

Cleaning, Coating and Finishing

322-L. New Developments in Tests of Coatings and Wrappings. Graydon E. Burnett and Paul W. Lewis. *American Water Works Association, Journal,* v. 48, Feb. 1956, p. 100-120.

Laboratory and field tests of protective coatings and wrappings for steel water pipe conducted by the Bureau of Reclamation. Coatings tested were proprietary products and have been in service up to 5 years. Tables, photographs. 4 ref. (L26, ST, Zn, Pb, Al, Fe)

323-L. Design of Steel Pipe With Cement Coating and Lining. E. Shaw Cole. *American Water Works Association, Journal,* v. 48, Feb. 1956, p. 131-138.

Steel pipe with diameters of 30 in. or larger is protected by a cement coating and cement lining. Tables, photographs, graph. 8 ref. (L27, ST)

324-L. Latest Developments in Plating Automation. *Automotive Industries,* v. 114, Mar. 1, 1956, p. 40-43.

Special features of automatic equipment and controls necessary for modern operation of both large and small plating lines. Photographs. (L17)

325-L. X-Ray Analysis as a Guide to Chemical Cleaning. A. W. Coulter, C. M. Maddin and R. B. Rosene. *Combustion,* v. 27, Feb. 1956, p. 55-58.

X-ray analysis identifies not only the individual elements in the deposit but also the compounds or chemical structure of the scale. Photographs, graphs, tables. 9 ref. (L12, S11)

326-L. Paint Faults and Remedies. XVII. H. Courtney Bryson. *Corrosion Prevention and Control,* v. 3, Feb. 1956 p. 40-42.

Causes and preventive measures for precipitation, rain spotting, ropiness, sagging, other defects. Photographs. (To be continued.) (L26)

327-L. Electro-Zinc Coated Steel Sheet and Strip. D. A. Winton. *Corrosion Prevention and Control,* v. 3, Feb. 1956, p. 45-46.

Plating equipment and methods. Properties of coated sheet and strip. (L17, CN, Zn)

328-L. Anodic Film Growth on Hafnium in Nitric Acid. R. D. Misch and E. S. Fisher. *Electrochemical Society, Journal,* v. 103, Mar. 1956, p. 153-156.

In 70% nitric acid at room temperature, an anodic film developed uniformly over single hafnium crystals with a thickness dependent upon the metal crystal orientation. Micrographs, photograph, table. 6 ref. (L19, Hf)

329-L. Levelling in Bright Nickel Plating Solutions. K. E. Langford. *Electroplating and Metal Finishing,* v. 9, Feb. 1956, p. 39-43, 48.

The chemical properties of organic compounds are related to their suitability as levelling agents in bright nickel plating electrolytes. The beneficial effect of surface active agents in the solution is demonstrated. Levelling agents and methods. Diagrams, tables. (To be continued.) (L17, Ni)

330-L. Good Rinsing for Good Plating. Joseph B. Kushner. *Electroplating and Metal Finishing,* v. 9, Feb. 1956, p. 44-47.

Requirements, methods, materials and equipment. Diagrams. 8 ref. (L17)

331-L. Answers to Some Paint Application Problems. *Electroplating and Metal Finishing,* v. 9, Feb. 1956, p. 55-56.

Causes of miscellaneous paint defects such as orange peeling, rough finish, sik-screen clogging. Handling and overspray problems. Diagrams. (L26)

332-L. How to Surface Finish Stainless Steels. W. E. McFee. *Finish,* v. 13, Mar. 1956, p. 23-26.

Differences to be considered in drum sanding and polishing of stainless steel. Tables, photographs. (To be continued.) (L10, SS)

333-L. Development of Marine Paints: Recent Progress. A. D. C. Hamilton. *Industrial Finishing,* v. 9, Jan. 1956, p. 313-315.

The development of new and better types of protective paints, as applicable to requirements of various parts of ships. Photographs. (L26)

334-L. Flame Spraying Non-Metallic Protective Layers on to Metal Surfaces. Hans Reininger. *Industrial Finishing (London),* v. 9, Feb. 1956, p. 380, 382, 384. (Translated from *Metalloberfläche,* v. 9, no. 1, 1955.)

Previously abstracted from the original. See item 169-L, 1955. (L26)

335-L. Advanced Techniques for Tight Coating of Zinc. Nelson E. Cook. *Industrial Heating,* v. 23, Feb. 1956, p. 312 + 5 pages.

Cook-Norteman tight-coat galvanizing, making use of many new and unique technical procedures, simplifies and improves galvanizing through localized control for adherence. Photographs. (L16, Zn, Al, Te)

336-L. Tentative Standard Method for the Assessment of the Rust Preventing Characteristics of Hard Film and Soft Film Temporary Corrosion Preventives. *Institute of Petroleum, Journal,* v. 42, Feb. 1956, p. 50-54.

Report on method in which test panels are exposed to sulfur dioxide. Effectiveness and reproducibility studies. Tables. 3 ref. (L26, R11)

337-L. Simple Test Checks Aluminum Coating Uniformity. H. J. Wittrock. *Iron Age,* v. 177, Feb. 16, 1956, p. 102-103.

Technique involved is similar to

the Preece test for galvanized steel; provides accurate gage of coating uniformity, plus an estimate of coating thickness. Micrographs, photographs. (L16, Al)

338-L. Is Bronze Plating Your Next Step? R. T. Gore and F. A. Lowenheim. *Iron Age,* v. 177, Feb. 16, 1956, p. 104-107.

The progress, advantages, processes used, future possibilities of copper-tin alloy as a metal finish. Photographs. (L17, Cu)

339-L. Canadian Tinplate. J. D. Harbron. *Iron and Steel,* v. 29, Feb. 1956, p. 49-50.

Electrolytic lines replace older hot dip methods. Photographs, graph. (L17, Sn)

340-L. Protective Coal Tar Coatings in Steel Plants. W. F. Fair, Jr., and H. J. Cibula. *Iron and Steel Engineer,* v. 33, Feb. 1956, p. 106-116; disc., p. 116-118.

Guide to preventive maintenance including design of plant, surface preparation, environment and types of coatings. Photographs, micrograph, graphs, tables. 11 ref. (L26, ST)

341-L. Plating Metal-Powder Parts. Charles C. Cohn. *Machine Design,* v. 28, Mar. 8, 1956, p. 113-114.

Survey of methods for preparation of sintered-metal parts for plating. Photograph, micrographs, table. (L17)

342-L. Try Flame-Plated Coatings Where Service is Severe. M. A. Teter. *Materials & Methods,* v. 43, Feb. 1956, p. 100-102.

Tungsten carbide flame-plated coatings increase service life and can be used on a wide variety of metals. Photographs, table, diagrams. (L24, W)

343-L. Some Tips on Electroforming. Marv Rubinstein. *Metal Finishing,* v. 54, Feb. 1956, p. 52-56.

General discussion of electroforming includes applications, advantages and disadvantages, metals and solutions, stress, selection of bath and metal, some standard practice. Photographs, table. (To be continued.) (L18)

344-L. Production Barrel Finishing. Albert Polucha. *Metal Finishing,* v. 54, Feb. 1956, p. 57-64.

Planning and layout, equipment and operating procedure, the processing of aluminum, brass, copper, plastic, steel and zinc, finishes and finishing media, fixture machines. Diagrams. (L10, Cu, Al, ST, Zn)

345-L. Proposed "Substitutes for Nickel Plating". A. Kenneth Graham. *Metal Finishing,* v. 54, Feb. 1956, p. 65-68.

Present status of nickel plating industry. Arguments against substitutes. Data on substitute coatings on ferrous basis metals. Tables. 1 ref. (L17, L14, Ni, Cr)

346-L. Metal Brightening. H. Silman. *Metal Industry,* v. 88, Feb. 10, 1956, p. 105-108, 111.

Reviews electrolytic and chemical methods for aluminum, stainless steels and other metals. Applications, advantages, limitations. Graphs, table. 8 ref. (L13, L12, Al, Fe, SS)

347-L. New Industrial Uses of Electropolishing. (Digest of "Present Status of the Electropolishing of Steel and Special Alloys in Industry", by P. Jacquet and R. Mondon; sponsored by Société Francaise de Métallurgie, June 1955.) *Metal Progress,* v. 69, Mar. 1956, p. 168, 170, 172.

Important applications in field of steels and special alloys for detection of defects, as a substitute for mechanical polishing, and for creation of a surface with improved frictional properties and wear resistance. (L13)

348-L. Metallurgy of T. R. Cell Production. Use of Diffused Copper Coatings on Mild Steel. D. S. Hills and W. L. Hirsh. *Metal Treatment and Drop Forging,* v. 23, Feb. 1956, p. 72-74.

Metallurgical problems involved in quantity production of a wave-guide device used in high-frequency radar systems. Photographs. (L15, Cu, ST)

349-L. How to Finish Stainless Steel. Richard E. Paret. *Metalworking Production,* v. 100, (Combined Issue), Feb. 10 and 17, 1956, p. 231-246.

Mill finishes and their protection, grinding, polishing and buffing, finishing small or complex parts, decorative finishes, cleaning and descaling. Photographs, tables. (L10, L17, L26, SS)

350-L. Electron Microscope Study of Paint Surfaces. Sumner B. Twiss, D. Maxwell Teague and William L. Weeks. *Official Digest, Federation of Paint and Varnish Production Clubs,* v. 28, Feb. 1956, p. 93-111.

Review of present knowledge of paint films as revealed by electron microscope. Two-stage polyvinyl alcohol-silica replication technique. Chalking of paint due to natural weathering and to ultraviolet radiation. Micrographs. 23 ref. (L26, M21)

351-L. Effect of Gamma Radiation on the Stress-Strain Properties of Unpigmented Soya Alkyd Resin Wet Films. L. L. Carrick and George C. Sun. *Paint and Varnish Production,* v. 46, Feb. 1956, p. 30-33, 91.

Gamma radiation has little effect on the physical properties but moderately reduces the induction drying period of wet films. Maximum and breaking loads occurred at nearly the same elongation value. Graphs, table. 4 ref. (L26, Q25)

352-L. Chlorinated Rubber Paints. F. K. Shankweiler. *Paint and Varnish Production,* v. 46, Mar. 1956, p. 27-32, 75.

Comparison of the principal properties of natural rubber and chlorinated rubber. Film properties, modifiers, metal preparation, film thickness and the cost of applying paints. Photographs, tables. (L26)

353-L. The Effect of Impact Tests on Life of Paint Systems. Max Kronstein and W. H. Kapfer. *Paint and Varnish Production,* v. 46, Mar. 1956, p. 33-47, 82.

New methods for the evaluation of the effect of impact tests on the life of paint systems over metal phosphate treatments on steel. Diagrams, graph, photograph, micrographs, tables. 4 ref. (L26, ST)

354-L. What to Expect From Internal Coatings. J. C. Watts. *Pipe Line Industry,* v. 4, Mar. 1956, p. 20-23.

Application, costs, performance, future prospects for internal coatings of pipe lines. Photographs, tables. 5 ref. (L26)

355-L. 12 Musts for a Good Pipe Coating Job. Marshall E. Parker. *Pipe Line Industry,* v. 4, Mar. 1956, p. 31-34.

Considerations to watch for, starting with storage and handling of materials, continuing during actual application, and including handling of coated pipe until it is in the ditch and backfilled. Photographs. (L26)

356-L. Tropical Deterioration of Automobile Paint Finishes. A. J. Birch. *Products Finishing,* v. 9, Jan. 1956, p. 50-64.

Analyzes tropical breakdown in detail, compares it with accelerated test results, describes some advances in tropical testing. Micrographs, photographs. (L26)

357-L. Temporary Protection Coatings. I. Metallic Naphthenate Solutions. E. Strong. *Products Finishing,* v. 9, Feb. 1956, p. 65-83.

Available temporary coatings for protecting raw material and fabricated parts in manufacturing and assembly, desirable qualities and a consideration of the possible applications of metallic naphthenate solutions. Diagrams, graphs, micrographs, photographs, tables. (To be continued.) (L26)

358-L. Pickling Processes Reviewed. IV. Treating Heat Resistant and Corrosion Resistant Metals. D. J. Fishlock. *Products Finishing,* v. 9, Feb. 1956, p. 84-97.

Concerned with the treatment of stainless steels and various nonferrous alloys. Photographs. (To be continued.) (L12, SS)

359-L. New Markets and Techniques for Precious Metal Electroplates. Alfred M. Weisberg. *Products Finishing,* v. 20, Feb. 1956, p. 26-32.

Applications of gold alloys, rhodium, platinum and palladium in electronic and industrial decorative industries. Plating methods and equipment. Photographs. (L17, T1, Rh, Au, Pd, Pt)

360-L. Preparing and Painting Zinc Surfaces. Ernest W. Horvick. *Products Finishing,* v. 20, Feb. 1956, p. 36 + 7 pages.

Choice of finishing material, methods of cleaning metal surface, chemical and mechanical pretreatment, baking temperatures, protective films. Photographs, tables. (L26, L12, Zn, Cr)

361-L. Automation in a Job Shop. Ezra A. Blount. *Products Finishing,* v. 20, Mar. 1956, p. 20-27.

Combination of automatic barrel finishing and barrel plating operations is used in converting rough, rusty, scale-containing steel parts to smooth, brilliant gold and rhodium plated ones at the rate of five tons per day. Photographs, diagram. (L17, ST, Au, Rh)

362-L. Form the Product After It's Finished. Frank Chatterton. *Products Finishing,* v. 20, Mar. 1956, p. 34-38.

Outstandingly tough coatings are applied to metal containers, closures and toys before parts are formed. They are roller coated and printed on flat metal sheets, and baked. Finished parts are then formed and cut in metal stamping dies with no damage to coatings. Photographs. (L26, G3, ST, Al)

363-L. Deposition of Coatings by Electrophoresis. C. Fred Gurnham. *Products Finishing,* v. 20, Mar. 1956, p. 62 + 6 pages.

Theory, applications, advantages, deposition process and aftertreatment. Photograph, micrographs. (L general)

364-L. Hot-Dip Aluminized Steel. Its Preparation, Properties and Uses. M. L. Hughes. *Sheet Metal Industries,* v. 33, no. 346, Feb. 1956, p. 87-97; disc., 97-98.

Aluminizing of strip wire and fabricated articles; properties of aluminized mild steel; hot-dip galvanizing of other metals and alloys; applications. Micrographs, photographs, graphs, table. 22 ref. (L16, Al, ST)

365-L. Some Aspects of the Properties and Uses of Electrolytically Coated Sheet Steel. F. H. Smith and T. C. Tapp. *Sheet Metal Industries,* v. 33, no. 346, Feb. 1956, p. 99-106; disc., 106, 113.

Electrotinning and electrozinc coating plants, applications, pretreatment and painting for electrozinc-coated sheets. Photographs, diagrams, tables. (L17, ST, Zn, Sn)

366-L. Modern Painting and Stoving Techniques—With Particular Reference to Flow Coating. J. J. Stordy and W. G. J. Appleton. *Sheet Metal Industries,* v. 33, no. 346, Feb. 1956, p. 115-123.

Dip and spray painting and flow coating techniques. Equipment and procedures for last-named method described in considerable detail. Photographs. (L26)

367-L. Metal Spraying by the Wire Process. H. J. Plaster. *British Welding Journal,* v. 3, Mar. 1956, p. 73-77.

Methods of application, the equipment (hand and automatic), anticorrosive coatings, and building up of worn parts. Photographs. 4 ref. (L23, ST, Al, Zn)

368-L. Developments in Shot Blasting Strip Steel. K. R. Keska. *Iron and Steel Engineer,* v. 33, Mar. 1956, p. 65-72.

Indications show that shot blast cleaning equipment has a very definite place, particularly on hot rolled pickled steel, which is to be later coated with paints, oxides or metallic coatings. Photographs, diagrams. (L10, ST)

369-L. A New Development in Metal Cladding. George Durst. *Journal of Metals,* v. 8, Mar. 1956, p. 328-333.

Standard simultaneous application of heat and pressure in the bonding process has been separated into two separate operations to produce a new cladding process. Photographs. 10 ref. (L22)

370-L. Some Tips on Electroforming. Marv Rubenstein. *Metal Finishing,* v. 54, Mar. 1956, p. 56-59.

Materials and design of mandrels, mechanical, chemical and fusiblemetal films as parting media, racking and jigging methods. Photographs, diagrams. (To be continued). (L18)

371-L. Further Studies in Heavy Rhodium Plating. H. J. Wiesner and H. A. Meers. *Plating,* v. 43, Mar. 1956, p. 347-355.

Quality control program instituted to minimize rejects due to plating, stress measurements and other tests, effects of inorganic additives in rhodium baths, phenol sulfonic acid as an addition agent in rhodium sulfate solutions. Graphs, photographs, tables. 6 ref. (L17, Rh)

372-L. Ultrasonic Cleaning. Frank Hightower. *Plating,* v. 43, Mar. 1956, p. 358-362.

Ultrasonic techniques applied to usual cleaning baths, thereby improving performance so as to do same job with fewer cleaning stages or shorter cycle. Also makes it possible to clean inside hollow parts and deep recesses without hand brushing or swabbing. Description of some new transducers which operate in water and in water solutions of detergents or alkaline cleaners. Diagrams, graphs, photographs. (L10)

373-L. (German.) **Distortions and Stresses in a Cast Iron Enamelled 6000-Liter Stirred Reaction Vessel.** L. Weiss, P. Gayer, and G. Matz. *Chemie-Ingenieur-Technik,* v. 28, no. 1, Jan. 1956, p. 31-39.

Extensive expansion measurements with electrical expansion indicators were conducted on cast iron and enamel to determine distortions and stresses which occur. Such calculations permitted, for the first time, a comparison of the cast iron and enamel distortions resulting from an increase of the internal pressure. Graphs, diagrams, tables, photographs. 10 ref. (L27, Q25, CI)

374-L. (German.) **Evaporation of Very Thin Copper and Silver Layers.** Ottmar Knacke and Rudolf Schmolke. *Zeitschrift für Metallkunde,* v. 47, no. 1, Jan. 1956, p. 22-24.

Copper and silver layers on tungsten show a supernormal evaporation rate and thicknesses below 0.1 to 0.2 μ cannot exist above 943 and 775° C., respectively. Gold shows the same behavior. Table, graphs, diagram. 10 ref. (L25, Ag, Au, Cu)

375-L. (German.) **Internal Stresses in Galvanic Copper Deposits.** Hellmuth Fischer, Peter Huhse and Franz Pawlek. *Zeitschrift für Metallkunde,* v. 47, no. 1, Jan. 1956, p. 43-49.

Internal stresses in galvanic deposits of copper determined by magnetic and mechanical methods in relation to inhibitor concentration. A closely related variation of stress, hardness and texture observed with β-napthoquinoline. Graphs, diagrams, micrographs. 7 ref. (L17, Q25, Cu)

376-L. (Polish.) **Phosphatizing of Wires and Bars Before Cold Drawing, and Its Importance for the Wire-Drawing Industry.** Leszek Kus. *Hutnik,* v. 22, no. 9, Sept. 1955, p. 318-324.

Preparation of surface for coating by degreasing, pickling or mechanical cleaning. Phosphate coating facilitates drawing, protects against corrosion or serves to insulate at low voltages. Chemical compositions of phosphate preparations. Techniques and apparatus for phosphatizing. Tables, micrographs, photograph. 7 ref. (L14, F28)

377-L. (Polish.) **Red-Lead Paints and a Quick Method for Their Evaluation.** Z. Klonowski and M. Knopf. *Przemysl Chemiczny,* v. 12, no. 1, Jan. 1956, p. 43-47.

Rapid potentiometric method for ascertaining the protection value of these paints. Linseed oil and low red lead paints tested in various media. Diagrams, graphs. (L26)

378-L. (Polish.) **Surface Treatment of Aluminum and Its Alloys.** Karol Körner. *Technika lotnicza,* v. 11, no. 1, Jan. 1956, p. 18-22.

Stages and variations of the anodizing process. Hardness, thickness, porosity, color, insulative ability and corrosion resistance of anodic films. Electropolishing chemical-conversion coatings compared with anodizing results. Tables, photographs. 14 ref. (L19, Al)

379-L. (Russian.) **Grinding and Polishing of Ceramic Alloys.** V. A. Shal'nov. *Stanki i Instrument,* v. 27, no. 1 Jan. 1956 p. 26-28.

Effect of microstructure grain size, hardness of grinding wheel, rate of feed and depth of layer to be ground off. Results compare with diamond and silicon-carbide polishing. Comparison of polishing of structural steels and ceramic alloys. Graphs, diagrams, photograph. (L10)

380-L. (Russian.) **Wear-Resistance of Coatings Used in the Repair of Machine Parts.** V. I. Kazartsev. *Vestnik mashinostroeniia,* v. 36, no. 1, Jan. 1956, p. 63-66.

Coating with smooth or porous chromium; hard-facing with electrolytic iron-plating; variations in heat treatment and in preparation of surface. Tables, graph, diagrams. (L17, L24, Q9, ST)

381-L. (Russian.) **Metallizing, by the Spray Method, in the Repair of Equipment.** A. M. Edel'son. *Vestnik mashinostroeniia,* v. 36, no. 1, Jan. 1956, p. 66-67.

Advantages, economy and techniques of repairing wire-drawing band surfaces by metallizing, rather than by dechromizing and rechromizing. Diagram. (L23)

382-L. (Russian.) **Electro-Chemical Tinning of Iron Sheets in Chloride Solutions.** V. P. Kochergin, T. A. Nimvitzkaia and M. Ia. V'iunova. *Zhurnal Prikladnoi Khimii,* v. 29, no. 1, Jan. 1956, p. 59-63.

Tinning from acid solutions produces porous, lusterless surfaces on cold rolled iron sheet; however, tinning from acid solutions of sheet previously treated in basic tin solution, at a cathode current density of 1 to 2 amp. per sq.dm., gives a bright surface and very low porosity. Graphs. 14 ref. (L17, Sn)

383-L. Notes on Experiments in Electrodeposition With Perfluorinated Acids. John K. Taylor and Abner Brenner. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 13-14.

Two acids, in particular, were studied in a chromium plating bath and deposits obtained from nickel baths, which contained only the salts of these acids, were studied. Tables. (L17, Cr, Ni)

384-L. Tripoli as an Abrasive in the Development of Buffing Compounds. James Badaluco. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 67-69.

Occurrence, mining and properties of tripoli which make it invaluable to the buffing compound industry; specifications and laboratory control in making economical and efficient compositions. Photographs. (L10)

385-L. A Nonoxidizing Heat Test for Plating Adhesion. I. Wm. Marcovitch. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 81-82.

A method that does not oxidize the surface in the use of hot fat or oil normally used to flow tin or tin-lead alloy coatings. 4 ref. (L17)

386-L. Phosphate Coating of Metal Surfaces for Industrial Use. W. R. Cavanagh and R. C. Gibson. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 100-106.

Factors involved in phosphate coating of steel; phosphate coatings serve as a corrosion protection, as a base for paint, as an aid in the cold forming of metals, and to reduce wear. Micrographs, table. 17 ref. (L14, ST)

387-L. Some Aspects of Solution Level Control. John W. Holland, Loren Stevens and Nello Arterburn. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 142-145.

Emphasizes the many relations of solution level control and reviews some of the methods employed to accomplish better control. Diagrams. (L17)

388-L. Electrolytic Coatings on Magnesium Base Alloys From Alkaline Chromate Solutions. Fielding Ogburn, Harry I. Salmon and M. L. Kronenberg. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 185-188.

A low-voltage alkaline chromate process which produces a protective coating on magnesium alloys comparable to the coatings produced by the acid chromate and HAE processes. Tables. 2 ref. (L17, Mg)

389-L. Job Plating Shop Costs and Their Relationships to Pricing. Ar-

thur G. Pierdon. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 225-227.

Reviews the many expenses encountered in operating a job plating shop by using the results of a cost survey made by the National Association of Metal Finishers; suggests a simple method for rapidly determining whether the sale price on an individual order has yielded a profit. (L17)

390-L. Purchasing Problems of a Manufacturer of Metal Finishing Equipment. E. M. Close. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 228-230.

Presents to purchasing representatives and technical representatives of the electroplating industry a picture of a few of the problems which are confronted in the procurement of materials for the manufacture of electroplating equipment. (L12, A4, T5)

391-L. Modified Joliot Apparatus for Study of the Electrodeposition of Radioactive Materials. W. H. Power and J. W. Heyd. *Analytical Chemistry,* v. 28, Apr. 1956, pt. 1, p. 523-525.

An apparatus for continuously recording the deposition or dissolution of radio-active material upon a radiation-transparent electrode during potential change. Diagrams, graphs. 3 ref. (L17)

392-L. (German.) **Influence of Anodizing Variables on the Growth and Various Properties of the Oxide Film.** D. Lenz. *Aluminium,* v 32, no. 3, Mar. 1956, p. 126-135.

Optical and chemical properties are deduced from anodizing in sulphuric acid. Processes occurring during anodizing; effect of electrolyte, current density, voltage and temperature on structure of the oxide film, with special reference to the shape and size of the specimens; thickness of the nonporous primary film; dimensions of the oxide cells and of their cup-shaped primary films. Table, graphs, diagrams, micrographs. 14 ref. (To be continued.) (L19, Al)

393-L. (German.) **New Methods for the Cleaning and Degreasing of Aluminum With Solvent Vapor.** *Aluminium,* v. 32, no. 3, Mar. 1956, p. 142-144.

Method and equipment used in the "Fermeco" system of vapor degreasing and its fields of application. Diagram, photograph. 2 ref. (L12, Al)

394-L. (German.) **Adhesion of Iron-Saturated Zinc Melts on Carbon Iron (Steel).** Dietrich Horstmann. *Archiv für das Eisenhüttenwesen,* v. 27, no. 2, Feb. 1956, p. 85-93.

Time and temperature effect of iron-saturated zinc-melts on iron with a carbon content ranging up to 2.08%. Tables, graphs, micrographs. 11 ref. (L16, Fe, Zn)

395-L. (German.) **Black Spots in Galvanized Coatings.** H. Bablik, F. Götzl and E. Nell. *Metalloberfläche,* v. 10, no. 2, Feb. 1956, p. 33-34.

Effect of aluminum in the flux on black stains in the coating. Counter-measures to prevent formation of spots. Micrographs. (L16, Zn)

396-L. (German.) **Growth of Galvanic Deposits. X. Gold-Copper Alloys.** E. Raub and F. Sautter. *Metalloberfläche,* v. 10, no. 3, Mar. 1956, p. 65-72.

Growth and properties of deposited gold-copper alloys; effect of cyanide content on electrolytic deposition of copper in cyanide baths; deposit of gold-copper alloys from low pH baths or low cyanide content; mixed crystals between gold and copper in deposits. Tables, graphs. 8 ref. (L17, Au, Cu)

397-L. (German.) **Hardness Determination With Small Loads. II. Fundamentals and Influences of the Measurement.** H. Wiegand, M. Koch, and H. J. Meyer. *Metalloberfläche,* v. 10, no. 3, Mar. 1956, p. 73-75.

Preparation of specimens; effect of mechanical and electrolytic polishing on the measurement of etched samples. Graphs, micrographs. 12 ref. (L10, L13, Q29, Al, Cu)

398-L. (Russian.) **The Mechanism of the Surface Saturation of Iron and Steel With Bromine.** G. V. Samsonov and N. Ia. Tseitina. *Fizika metallov i metallovedenie,* v. 1, no. 2, 1955, p. 303-306 + 1 plate.

Depth of saturated layer in relation to time and temperature of treatment; relation of hardness to temperature; microstructure and heat-resistance of bromine-saturated layers. Tables, graphs, micrographs. 10 ref. (L15, R6, Q29, M27, ST, Br)

399-L. (Book.) **American Electroplaters' Society, Proceedings,** (Annual Volume), v. 42, 1955, 255 p. American Electroplaters' Society, 445 Broad St., Newark 2, N. J.

A compilation of 53 papers covering various aspects of electroplating. Papers separately abstracted. (L17)

400-L. (Book.) **Handbook of Barrel Finishing.** Ralph Enyedy. 255 p. 1955. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y.

Discusses finishing departments, layouts, finishing compounds and equipment used in barrel finishing; basic types of finishing methods. Diagrams, photographs. (L10)

401-L. (Book.) **Finishing Handbook and Directory. 1956.** I. S. Hallows, editor. 489 p. 1956. Sawell Publications Ltd., 4 Ludgate Circus, London, E. C. 4, England.

Types of paints, lacquers and varnishes. Sections appearing for the first time include curing faults in electroplating baths and treatment of electroplating wastes. (L general)

M

Metallography, Constitution and Primary Structures

153-M. Collodion Replicas From Cross-Sections of Thin Metallic Strip and Coatings. D. J. Evans. *British Journal of Applied Physics,* v. 7, Feb. 1956, p. 64-65.

The use of collodion as a replica material for obtaining electron micrographs of cross-sections of thin metallic strip and coatings. Micrographs. 2 ref. (M21)

154-M. A Comparison of Dry Stripped, Unbacked Collodion and Formvar Replicas. D. J. Evans. *British Journal of Applied Physics,* v. 7, Feb. 1956, p. 66-67.

Comparison favors dry stripped plastic replicas for routine metallographic examinations. 5 ref. (M21)

155-M. The Chemical Polishing and Etching of Certain Nimonic Alloys for Metallurgical Examination. E. Meace. *Electroplating and Metal Finishing,* v. 9, Feb. 1956, p. 51-52.

Materials and procedures. Results are comparable with electromethods. Table, micrographs. (M21, Ni)

156-M. Use of Punched Card Machines for Computing Sums of Products. The Application to Electron Diffraction Calculations. Judith Bregman. *Journal of Chemical Physics,* v. 24, Feb. 1956, p. 405-407.

Procedure uses only those International Business Machines calculators which may be available in installations not set up primarily for scientific computation. Table. 3 ref. (M22)

157-M. The Temperature Calibration of a High Temperature X-Ray Diffraction Camera. J. A. Brand and H. J. Goldschmidt. *Journal of Scientific Instruments,* v. 33, Feb. 1956, p. 41-45.

Factors affecting calibration of the thermocouple, methods for calibration and for reducing the necessary temperature correction. Diagrams, graphs, table. 17 ref. (M22, S16)

158-M. Studies in the Chemistry of Etching. II. Some Observations on the Chemistry of the Etching Bath. J. I. M. Lewis and W. T. Engledew. *Process Engravers' Monthly,* v. 63, Feb. 1956, p. 55-57.

Brief discussion of copper etching experiments on relative acidity variation with time and loss of weight variation with time. Graphs. 5 ref. (M21, Cu, Fe)

159-M. Magnesium-Uranium Alloy System. George A. Tracy, P. Chiotti and H. A. Wilhelm. *Ames Laboratory (U. S. Atomic Energy Commission),* ISC-377, June 1953, 54 p.

Analytical, X-ray, thermal and metallographic data, and proposed phase diagram. Methods and apparatus suitable for preparation of reactive metals under inert atmosphere; crucible materials. Tables, micrographs, graphs, diagrams. 14 ref. (M24, Mg, U)

160-M. The Constitution Diagram of Molybdenum-Rich Uranium-Molybdenum Alloys. H. A. Saller, F. A. Rough and D. C. Bennett. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-730, Mar. 1952, 17 p.

Data on uranium-molybdenum alloys containing 50 to 100 at.% molybdenum indicate that about 1.8 at.% of uranium is soluble in molybdenum at 1200° C. Graph, micrographs, table. 4 ref. (M24, Mo, U)

161-M. An Examination of Verwey's Model for the Lattice Structure of the Free Surface of Alkali Halide Crystals. G. C. Benson, H. P. Schreiber and D. Patterson. *Canadian Journal of Physics,* v. 34, Mar. 1956, p. 265-275.

The Verway model used to estimate effect of surface distortion on surface energy of these crystals. Several aspects of the model were examined, including effect of various repulsive potentials and forms of distortion. Tables, diagram. 15 ref. (M26)

162-M. (Czech.) **The Metallography of Lead-Coated Steels and Some of Their Defects.** Josef Teindl and L. Bezecny. *Hutnické listy,* v. 11, no. 1, Jan. 1956, p. 18-21.

Defects appearing during the lead coating of sheet examined, suggestion is made to use, for certain cases, the method of lead plating with suitable electrolytes and the passivation of the coating. Diagrams, photographs, micrographs. (M27, L17, Pb, CN)

163-M. (Dutch.) **Lattice Defects and the Plastic Deformation of Metals. I. Type and Properties of Lattice Defects; Mechanical Model of a Dislocation.** H. G. van Bueren. *Metalen,* v. 11, no. 2, Jan. 31, 1956, p. 35-39.

Includes diagrams. 5 ref. (To be continued.) (M26, Q24)

164-M. (French.) **A New Method of Micrographic Examination of Ura-**

nium by Formation of Oxide Layers. André Robillard, Janine Durand and Paul Lacombe. *Comptes rendus,* v. 242, no. 4, Jan. 23, 1956, p. 508-510.

A new method of electrolytic etching in which the reaction of alpha uranium with air forms oxide layers having different interference colors. Micrographs. 6 ref. (M21, U)

165-M. (French.) **Dilatometric Study of Heat Treatment of Copper Aluminums.** Pierre-Julien Le Thomas and Jeanne Cuvillier. *Fonderie,* 1956, no. 120, Jan. 1956, p. 28-32.

Study of treatment of copper aluminum by annealing and tempering; advantages of dilatometric method over micrographic method for investigation of properties. Graphs, phase diagram, micrographs. (M23, J general, Cu, Al)

166-M. (German.) **New Dilatometer and Its Application in Metallography.** Otto Werner. *Zeitschrift für Metallkunde,* v. 47, no. 1, Jan. 1956, p. 28-36.

An electronic device registers visibly the temperature or time dependence of length variations with magnification of 250 to 84,000. Graphs, diagrams, photographs. 35 ref. (M23)

167-M. (German.) **Structure of Crystalline Oxide Coatings on Monocrystalline Iron Layers.** Oswald Haase. *Zeitschrift für Naturforschung,* v. 11a, no. 1, Jan. 1956, p. 47-54 + 4 plates.

Preparation of iron single-crystal layers on preheated lithium fluoride surfaces in vacuum under different conditions. X-ray studies of surface structure. Diagrams, micrographs, graph, tables. 19 ref. (M26, Fe)

168-M. (Russian.) **Ternary and More Complex Solid Solutions of Metallic Compounds.** I. I. Kornilov. *Doklady Akademii Nauk SSSR,* v. 106, no. 3, Jan. 21, 1956, p. 476-478.

Conditions for the formation of continuous solid solutions, including similarity of crystal lattices and atomic similarity of the elements in the compounds. Diagram. 10 ref. (M24)

169-M. (Russian.) **Plotting the Boundaries of Limited Solubility in a Ternary System, by the Microhardness Method.** V. M. Glazov, M. V. Zakharov and M. V. Stepanova. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk,* 1956, no. 1, Jan. 1956, p. 162-164.

Relation of temperature to solubility of chromium and zirconium, either separately or combined, in copper. Phase diagrams, tables. 5 ref. (M24, Cu, Cr, Zr)

170-M. (Russian.) **Influence of Crystallization Conditions on Macrostructure of Aluminum Alloys.** A. A. Popov. *Liteinoe Proizvodstvo,* 1956, no. 1, Jan. 1956, p. 23-25.

Macrostructure of alloys cast in a circular mold. Structure of moldings cast under conditions of controlled cooling. Diagrams, photographs. 2 ref. (M28, N12, Al)

171-M. (Spanish.) **Measurement of Diffused Radiation in Aluminum.** Jose Ors Martinez. *Instituto del hierro y del acero,* v. 8, no. 41, Oct.-Dec. 1955, p. 782-796.

Analytical study of the absorption of X-rays by homogeneous metallic materials, as well as by materials having a lack of homogeneity in their structure, extending the study to the effect of diffused radiation in light metals, particularly aluminum. Graphs, diagrams, tables, photograph. 8 ref. (M22, Al)

172-M. (Russian.) **Phase Analysis of Titanium Alloys.** N. I. Blok, A. I. Glazova and N. F. Lashko. *Zavodskaia Laboratoriia,* v. 22, no. 1, 1956, p. 35-38.

Development of a method of electrolytic phase separation in titanium alloys by means of nonaqueous electrolytes. Titanium-chromium, titanium-chromium carbide, titanium carbide and titanium-chromium-aluminum carbide phases can be separated by this method. Tables. 5 ref. (M23, Ti, Cr, Al)

173-M. (English.) **Observation of Dislocations in Silver Halides. I. Annealed Crystals. II. Strained Crystals.** Hiroshi Kanzaki. *Physical Society of Japan, Journal,* v. 11, no. 2, Feb. 1956, p. 120-129.

Distribution of both the printed-out silver particles and the chemical etching pits was observed to determine dislocation patterns in annealed crystals of silver chloride and in strained crystals of silver bromide and chloride. Diagrams, micrographs. 14 ref. (M26, Ag)

174-M. (English.) **Electron Diffraction and Microscope Study of the Surface Structure of Copper Single Crystals.** Susumu Yoshida. *Physical Society of Japan, Journal,* v. 11, no. 2, Feb. 1956, p. 129-137.

Submicroscopic structure of electrolytically polished and etched crystal surfaces studied by means of electron diffraction and electron microscope, supplemented by the method of light figures. The etched surfaces are composed of submicroscopic facets which belong to (100) zone and the electropolished surfaces are smooth and undulating. Diagrams, graphs, micrographs, tables. 15 ref. (M26, Cu)

175-M. (French.) **Study of Geometric Imperfections in Metallic Monocrystals.** H. Lambot. *Revue Universelle des Mines,* v. 12, ser. 9, no. 2, Feb. 1956, p. 55-59.

Essential characteristics and application of an original X-ray diffraction method permitting the detection and precise measurement of geometrical imperfections in a metal grain. Diagram, X-ray photographs. 3 ref. (M26)

176-M. (German.) **Double-Etching as Determinant of Sulfidic Inclusions in Quality Iron Alloys.** Josefine Wallner. *Archiv für das Eisenhüttenwesen,* v. 27, no. 2, Feb. 1956, p. 101-102.

Etching according to M. Künkele's method, application of the method. Double etching by M. Künkele and P. Oberhoffer. Working procedure. Micrographs. 2 ref. (M21, ST)

177-M. (German.) **Aluminum Ingot Cast Texture and Its Significance.** Walter Roth and Margarete Schippers. *Zeitschrift für Metallkunde,* v. 47, no. 2, Feb. 1956, p. 78-85.

Structure of the cast ingots depends on the pouring technique and temperature changes during solidification. Diagrams, photographs, micrographs. 12 ref. (M28, N12, Al)

178-M. (Book.) **Solid State Physics.** Frederick Seitz and David Turnbull. v. I. 469 p. 1955. Academic Press Inc., 125 East 23rd Street, New York 10, N. Y. $10.00.

Comprehensive review of the important facets of solid-state science. (M general, N general, P general)

N

Transformations and Resulting Structures

149-N. Mechanisms of Hydrogen Producing Reactions on Palladium. II. Diffusion of Electrolytic Hydrogen Through Palladium. Sigmund Schuldiner and James P. Hoare. *Electrochemical Society, Journal,* v. 103, Mar. 1956, p. 178-181.

Diffusion rate of hydrogen through several thicknesses of palladium for varying current densities was measured. Relationship between diffusion current and total polarizing current was established. Diagram, graphs, table. 10 ref. (N1, Pd)

150-N. Diffusion Short Circuits in Metals. Robert E. Hoffman. *General Electric Review,* v. 59, Mar. 1956, p. 28-31.

Phenomenon of migration of atoms across grain boundaries, how grain boundary diffusion accounts for changes in grain size and affects final properties of an alloy. Photographs, radiograph, micrograph. (N1)

151-N. Diffusion and Oxidation of Metals. M. T. Simnad. *Industrial and Engineering Chemistry,* v. 48, Mar. 1956, pt. II, p. 586-601.

A review of the development in theories, experimental work and techniques. 371 ref. (N1, R2)

152-N. Growth and Some Properties of a Large Single Crystal of Cadmium Selenide. D. M. Heinz and E. Banks. *Journal of Chemical Physics,* v. 24, Feb. 1956, p. 391-398.

Method of growing large single crystals, preparation from pure materials, determination of electrical properties. Diagram, graphs, table. 31 ref. (N12, P15, Cd, Se)

153-N. Thermal Diffusion in Single Crystals of Zinc. F. R. Winter and H. G. Drickamer. *Journal of Chemical Physics,* v. 24, Feb. 1956, p. 492-493.

Diffusion measurements were made on single crystals both perpendicular and parallel to the crystal axis, using traces of thallium, silver and indium impurities. Graphs, table. 4 ref. (N1, Zn, Tl, Ag, In)

154-N. Grain Boundaries. II. Equilibrium Segregation to Grain Boundaries. D. McLean. *Metal Treatment and Drop Forging,* v. 23, Feb. 1956, p. 55-61.

Equilibrium segregation and its control by heat treatment. The thermodynamical theory of the formation of such grain boundaries. Diagram, micrograph, graph. 24 ref. (N1, J27)

155-N. On the Transition Temperatures of Superlattices Au_3Cu and $AuCu_3$. M. Shimoji. *Physical Society of Japan, Journal,* v. 11, no. 1, Jan. 1956, p. 91-92.

Discrepancy of transition temperatures of the solid alloys from that predicted by theory. Proposes an improved theory. 3 ref. (N10, Au, Cu)

156-N. The Transition to Superconductivity. P. R. Doidge. *Royal Society of London, Philosophical Transactions,* v. 248, ser. A, no. 954, Mar. 1956, p. 553-573.

A study of the gradation between the two types of behavior shown by pure and alloyed superconductors in the particular instance of solid solutions of indium in tin. Diagram, graphs, tables. 16 ref. (N11, P15, In, Sn)

157-N. Studies of the Aluminum-Uranium Alloying Reaction. D. W. Bareis. *Brookhaven National Laboratory (U. S. Atomic Energy Commission),* AECD-3795, Dec. 1949, 40 p.

An alloying reaction occurred wherever and whenever clean metallic surfaces of aluminum and uranium were brought into contact within the temperature range from 250 to 450° C. Anodization of the

aluminum surface prevented the alloying reaction. Graph, photographs, micrographs, X-ray diffraction patterns, tables. 14 ref. (N1, L19, Al, U)

158-N. Growth Twins in Germanium. G. F. Bolling, W. A. Tiller and J. W. Rutter. *Canadian Journal of Physics,* v. 34, Mar. 1956, p. 234-240 + 4 plates.

Occurrence found to be very markedly dependent upon thermal, constitutional and crystallographic conditions of solidification. In every case, the nucleation of a twin could be traced to a condition of supercooling, either absolute or constitutional, during solidification. Diagrams, micrographs. 10 ref. (N12, N2, Ge)

159-N. Uranium-Zirconium Diffusion Studies. D. R. Mash and B. F. Disselhorst. *Livermore Research Laboratory (U. S. Atomic Energy Commission),* AECD-3701, June 1954, 37 p.

Uranium diffusion into zirconium cladding of clad sheet specimens studied over temperature range from 300 to 1050° C. for times up to 1812 hr. Diagrams, micrographs, tables, graphs. 3 ref. (N1, U, Zr)

160-N. (English.) **A Microstructural Study of the Carbide Phase Changes on Tempering a Molybdenum Steel With 0.11 C and 2.14 Mo.** Kehsin Kuo. *Jernkontorets Annaler,* v. 140, no. 1, 1956, p. 24-46.

Structural changes accompanying conversion of Fe_3C into Mo_2C studied by means of light and electron microscopes. Electron microscope examination made on extracted carbides provided more detailed information concerning this conversion than other methods. Tables, graph, micrographs. 27 ref. (N8, AY)

161-N. (French.) **Temper Hardening of Austenitic Alloys Having Undergone an Intense Cold Working. Probably Intervention of a Disorder→Order Transformation.** Xavier Waché and Emile Josso. *Comptes rendus,* v. 242, no. 4, Jan. 23, 1956, p. 510-512.

Influence of intermediate cold working on temper hardenability in nickel-cobalt-chromium-molybdenum noncarburized complex alloys. Graph. 4 ref. (N8, N10, J29, AY)

162-N. (French.) **Study of Iron-Chromium Alloys Close to Equiatomic Composition.** Gilles Pomey. *Institut de recherches de la sidérurgie, publications,* ser. A, no. 117, Nov. 1955, 165 p.

Preparation of iron-chromium alloys, their properties in the range of solid solutions, and the $\alpha \rightleftarrows \sigma$ transformation. Tables, micrographs, graphs, charts, diagrams. 61 ref. (N8, B22, Fe, Cr)

163-N. (German.) **Changes of Microstructure of Graphite and Cobalt.** A. Kochanovska. *Acta Technica Academiae Scientiarum Hungaricae,* v. 13, nos. 3-4, 1955, p. 421-430.

Physical and physico-chemical property changes, produced by grinding, examined and compared. Graphs, micrographs, table, diagram. (N5, G18, Co)

164-N. (German.) **Martensite Transformation in the System Copper-Zinc.** Guido Bassi and Bengt Ström. *Zeitschrift für Metallkunde,* v. 47, no. 1, Jan. 1956, p. 16-21.

The stability of the β_1-lattice diminishes with increasing copper content, transforming to α by diffusionless translation. With lower copper content β_1 is obtained by the same mechanism of transformation. Additions of lead and bismuth lead to martensite-like structures. Tables, micrographs, phase diagrams, x-ray diffractograms. 13 ref. (N9, Cu, Zn)

165-N. (German.) **Effect of Elastic Stresses on Recrystallization Textures.** Hans Stadelmaier and B. F. Brown. *Zeitschrift für Metallkunde,* v. 47, no. 1, Jan. 1956, p. 1-8.

The anisotropy of the volume energy of a nucleus being stressed elastically during deformation causes a minimum value of the nucleation energy for the cube texture and the [100] fiber-texture. The appearance of the cube texture, depending on degree of deformation, alloying additions, and initial grain size, is closely connected with the strain hardening behavior during deformation. Diagraphs. 32 ref. (N15, Al, Cu, EG-c)

166-N. (German.) **Orientation of Thin Vapor-Deposited Metal Coatings. Investigation by Electron Interferometry.** H. Göttsche. *Zeitschrift für Naturforschung,* v. 11a, no. 1, Jan. 1956, p. 55-68 + 2 plates.

Determination of surface orientation of Ag, Au, Al, Pd and Cu on the 100-surface LiF, NaCl, KCl and KI crystals. Diagrams, tables, micrographs. 32 ref (N15, Al, Cu, EG-c)

167-N. (Italian.) **On the Activation Energy of Interstital Carbon and Nitrogen in Iron Alloys.** Andrea Ferro and Giorgio Montalenti. *Ricerca scientifica,* v. 25, no. 11, Nov. 1955, p. 3069-3081.

After measuring the diffusion of carbon contained in an iron-silicon alloy by magnetic relaxation methods, a theoretical explanation is given of the higher heat of activation shown by carbon and nitrogen atoms diffusing in iron alloys with respect to pure iron. Diagrams, graphs, table. 15 ref. (N1, P12, Fe, CN)

168-N (Russian.) **Study of Certain Physical Processes Occurring on the Surface of a Metal at High Temperature. I. "Natural Roughness" of the Surface of a Semicrystal.** Ia. E. Geguzin and N. N. Ovcharenko. *Izvestiia akademii nauk SSSR, otdelenie teknicheskikh nauk,* 1956, no. 1, Jan. 1956, p. 108-118.

Surface diffusion, interaction of metallic surface with gaseous phase (evaporation and condensation), and other mechanisms figure in the rough step-like or banded accretions or growth of the grain surface. Micrographs, diagrams, 8 ref. (N1, M27, N15, Cu)

169-N. (Russian.) **Hardening of Solid Solutions of Nickel at High Temperatures.** I. I. Kornilov. *Izvestiia akademii nauk SSSR, otdelenie tekhnicheskikh nauk,* 1956, no. 1, Jan. 1956, p. 119-125.

Relation of yield strength of nickel and its alloys and the hardening mutiple to temperature. Effect of chemical composition and number of components. Hardening in relation to distortion of crystal lattice of "solvent-metal". Hardened state preservation at high temperatures is dependent on the degree of saturation of the solid solution. Tables, graphs, 15 ref. (N7, J27, Ni, Cr)

170-N. (Russian.) **Stable Granulation Structure of Cast Steel.** D. K. Butakov. *Stal',* v. 16, no. 1, Jan. 1956, p. 44-50.

This structure reduces mechanical properties and is responsible for cracks and other defects in cast or forged parts. It is the result of the phase transformation delta iron → gamma iron and recrystallization. The stability of the structure can be eliminated by prolonged homogenization and cooling. Micrographs. 16 ref. (N12, N8, N5, CI)

171-N. (Russian.) **The Actual Distribution of Impurities in Crystals by the Drawing Out of the Melt Method and Possibilities of Further Developing the Method.** D. A. Petrov. *Zhurnal Fizicheskoi Khimii,* v. 30, no. 1, Jan. 1956, p. 50-55.

The drawing out of the melt method with the continuous addition to the melt allows bars (monocrystals) to be obtained of constant composition along their entire length. Graphs, diagrams, micrographs. (N12)

172-N. (Russian.) **Structure Formation During Eutectic Cyrstallization of Binary Alloys.** Ia. V. Grechnyi. *Zhurnal Fizicheskoi Khimii,* v. 30, no. 1, Jan. 1956, p. 184-189 + 2 plates.

The primary crystals of the phase, monocrystalline in the eutectic colony, initiate the eutectic transformation. Diagram, micrographs. 11 ref. (N12)

173-N. (Spanish.) **Alpha-Martensite in Cu-Al Beta-Alloys.** Jose Terraza Martorell and Y. Luis Gonzalez Vazquez. *Instituto del hierro y del acero,* v. 8, no. 41, Oct.-Dec. 1955, p. 707-718.

X-ray, micrographic and dilotometric study of martensite structures originating in the tempering of copper-aluminum beta alloys reveals the existence of a martensite phase which extends from the limit alpha/(alpha + beta) up to a concentration of from 11.23 to 11.5% aluminum. Graphs, diagrams, micrographs, radiograms. 30 ref. (N9, Cu, Al)

174-N. (Swedish.) **Formation of Sigma Phase in Stainless Steels.** Henrik Olsson-Werme. *Jernkontorets Annaler,* v. 140, no. 1, 1956, p. 47-74.

A literature survey of the formation of sigma phase in stainless steels and chromium and chromium-nickel steels. Influence of the sigma phase on mechanical properties and metallographic methods for identification of this phase. Graphs, tables, diagrams. 35 ref. (N8, SS, AY)

175-N. Micro-Autoradiography Applied to the Study of the Redistribution of Chromium During a Homogenizing Anneal. I. E. Bolotov and M. I. Gol'dshtein. *Henry Brutcher Translation No.* 3678, 5 p. (From *Zavodskaya Laboratoriya,* v. 21, no. 7, 1955, p. 828-830). Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 371-N, 1955. (N1, J23, ST, Cr)

176-N. Growth Layers Formed in the Reaction of Solid Iron With Liquid Aluminum and Aluminum Alloys. G. Gürtler and K. Sagel. *Henry Brutcher Translation No.* 3680, 9 p. (Abridged from *Zeitschrift Metallkunde,* v. 46, no. 10, 1955, p. 738-741.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 54-N, 1956. (N12, Al)

177-N. (English.) **On the Superstructure of the Ordered Alloy Cu_3Pd. I. Electron Diffraction Study.** Denjiro Watanabe and Shiro Ogawa. *Physical Society of Japan, Journal,* v. 11, no. 3, Mar. 1956, p. 226-239.

Ordered structures of copper-palladium alloys, chiefly of α'', phase were investigated by electron diffraction, using orientated, evaporated films. Diffraction patterns, photographs, tables, diagrams. 16 ref. (N10, M22, Cu, Pd)

178-N. (French.) **Radiocrystallographic Study of the Deformation and "Polygonization" of Iron Monocrystals.** J. Dejace. *Revue Universelle des Mines,*

v. 12, ser. 9, no. 2, Feb. 1956, p. 60-64.

Study of the behavior of a network of Armco iron monocrystals deformed by tension and subsequently tempered. Micrographs. 11 ref. (N5, Q24, Fe)

179-N. (German.) **Investigation of Isothermal Austenite-and-Martensite Decomposition of Unalloyed Steels in the Range From 100 to 400° C. by Means of Solvent Etching Methods.** Hans-Kurt Görlich and Hans Goossens. *Archiv für das Eisenhüttenwesen,* v. 27, no. 2, Feb. 1956, p. 119-126.

Separation of structural constituents for the requirements of electronic microscopy and fine structure tests. Proof for hexagonal ε-iron carbide. Process of transformation of ε-iron carbide into cementite. Determination of the lattice parameters of the hexagonal ε-iron carbide. Tables, graphs, diagram, micrographs, diffractograms. 21 ref. (N8, ST)

180-N. (German.) **Precipitation Phenomena in a Chromium-Nickel Steel Stabilized With Titanium, and Its Relationship to Inter-Crystalline Corrosion.** Karl Bungardt and Gustav Lennartz. *Archiv für das Eisenhüttenwesen* v. 27, no. 2, Feb. 1956, p. 127-133.

Analytical and X-ray investigation of steel with 0.07% carbon, 17.5% chromium, 0.4% molybdenum, 0.013% nitrogen, 10.4% nickel, and 0.47% titanium. Graphs diagram. 10 ref. (N7, R2, AY)

181-N. (German.) **Investigation of Tempering and Growth Structure of Metal Single Crystals With a Field Electron Microscope.** M. Drechsler and R. Vanselow. *Zeitschrift für Krisetallographie,* v. 107, no. 3, Feb. 1956, p. 161-181.

Investigation of tantalum, tungsten and nickel single crystal surfaces. Application of a method based on dislocation energy for determination of growth structures. Tables, diagrams, micrographs. 29 ref. (N12, Ni, Ta, W)

182-N. (German.) **Investigation of Growth Speed Orientation Dependency in Primary Recrystallization of Aluminum Single Crystals.** Bernhard Liebmann, Kurt Lücke, and George Masing. *Zeitschrift für Metallkunde,* v. 47, no. 2, Feb. 1956, p. 57-63.

The rate of growth during the process of recrystallization depends on crystallographic orientation and on direction of prior deformation. Diagrams, graphs. 30 ref. (N5, Al)

183-N. (German.) **Effect of Small Intrusions on the Recrystallization Behavior of High-Grade Pure Aluminum.** Georg Masing, Kurt Lücke and Peter Nölting. *Zeitschrift für Metallkunde,* v. 47, no. 2, Feb. 1956, p. 64-74.

Additions of manganese, zinc and nickel, in amounts of 0.01 at.%, greatly slow down recrystallization. The effect is attributed to foreign atoms dissolved in mixed crystals, which have a tendency to gather at the grain boundaries. Tables, graphs, diagrams, diffractograms. 21 ref. (N5, Al)

184-N. (German.) **Hydrogen Solubility in Aluminum, Lead, and Zinc Melts.** Wilhelm Hofmann and Jürgen Maatsch. *Zeitschrift für Metallkunde,* v. 47, no. 2, Feb. 1956, p. 89-95.

Method and degree of accuracy for determining the gas contents of metals. Tables, graphs, diagrams. 9 ref. (N15, Al, Pb, Zn)

185-N. (Japanese.) **Study on Blowholes in Iron and Steel. II. Composition of Gases in Blowholes.** Takehiko Fujii. *Iron & Steel Institute of Japan, Journal,* v. 42, no. 2, Feb. 1956, p. 94-99.

Equipment and procedures for sampling and analyzing blowhole gases. Mechanism of gas formation and diffusion. Graphs, tables, photographs, diagrams. 7 ref. (N15, S11, Fe, ST)

186-N. (Russian.) **X-Ray Study of Reaction Diffusion in the Copper-Selenium and Copper-Tellurium Systems.** V. I. Arkharov and S. Mardeshev. *Fizika metallov i metallovedenie,* v. 1, no. 2, 1955, p. 281-285.

Comparison of mechanism of diffusion reaction between solid copper and the gaseous phase of selenium or tellurium, with same type of reaction between copper and oxygen or sulfur. Phase composition of scale formed and microstructural features. Photographs, diagram, tables. 7 ref. (N1, R9, Cu)

187-N. (Russian.) **Theory of Method for Determining Diffusion Coefficient Along Grain Boundaries of Metals.** V. T. Borisov and B. Ia. Liubov. *Fizika metallov i metallovedenie,* v. 1, no. 2, 1955, p. 298-302.

Equations, based on Fisher's model, cover distribution of dissolved substance not only throughout grains of polycrystals, but also on intergranular boundaries, taking into account lattice distortions, local stresses, and the like. Graph. 6 ref. (N1)

188-N. (Russian.) **Effect of Small Additions of Silver or Zinc on the Solubility of Copper in Aluminum.** L. M. Magat and N. I. Noskova. *Fizika metallov i metallovedenie,* v. 1, no. 2, 1955, p. 307-310.

Mechanism of effect of small amounts of dissolved admixtures on kinetics of aging; effect of growth of crystallites and decomposition of supersaturated solid solution. Relation of solubility of copper to temperature, in pure aluminum and with various additions. Tables, graphs. 4 ref. (N12, N7, Cu, Al, Ag, Zn)

189-N. (Russian.) **X-Ray Study of the Aging of Aluminum Alloys. III. Use of X-Ray-Goniometric Methods to Determine the Mutual Orientation of Phases. IV. Methods of Calculating and Interpreting the Pictures of Diffusion Scattering.** Iu. A. Bagariatskii. *Fizika metallov i metallovedenie,* v. 1, no. 2, 1955, p. 316-338.

Crystallographic orientation and state of hardening after artificial aging and high-temperature tempering. Formulas derived which make it possible to pass from coordinates of diffusion maximums, measured on the one-dimensional photograph, to the three-dimensional depiction of the reciprocal lattice for cubic crystals. Graphs, diagrams, X-ray diffractograms. 39 ref. (N7, M23, Al, Cu, Mg)

190-N. (Russian.) **Aging of Aluminum-Copper Alloy.** N. N. Buinov. *Fizika metallov i metallovedenie,* v. 1, no. 2, 1955, p. 339-348.

Different stages of aging are followed by electron micrography. Relation between hardness of alloy and aging time at 190° C. Microstructural peculiarities. Micrographs, graphs. 13 ref. (N7, Q29, M27, Al, Cu)

191-N. (Russian.) **X-Ray and Electron Microscope Study of the Aging of Alloy Al-Zn.** N. N. Buinov and L. I. Podrezov. *Fizika metallov i metallovedenie,* v. 1, no. 2, 1955, p. 349-358.

Distribution of zones and particles of zinc by size after different time-temperature conditions. Microstructural peculiarities. Micrographs, graphs. 12 ref. (N7, M27, Al, Zn)

P

Physical Properties and Test Methods

200-P. Attenuation of 5 Mc. Sound in Aluminum at Low Temperatures. T. S. Hutchison and A. J. Filmer. *Canadian Journal of Physics,* v. 34, Feb. 1956, p. 159-165.

Attenuation of 5 Mc. sound waves in polycrystalline aluminum has been found to reach a maximum at 155° K.; activation energy for the process agrees with that deduced by Mason from a theory of dislocation relaxation. Diagram, graphs. 8 ref. (P10, Al)

201-P. Mechanism of Hydrogen Evolution at Tellurium Cathodes in Hydrochloric Acid. I. A. Ammar and S. A. Awad. *Electrochemical Society, Journal,* v. 103, Mar. 1956, p. 182-186.

Hydrogen overpotential at tellurium cathodes was studied in the concentration range 0.005*N* to 5*N* aqueous hydrochloric acid at 30° C. In concentrated solutions, a rate-determining dual electrochemical catalytic mechanism, with a slope of 0.06 v. at 30° C., was suggested to explain the results in the low current density range. Diagram, graphs, tables. 15 ref. (P15, Te)

202-P. Electrochemical Techniques in the Thermodynamics of Metallic Systems. R. A. Oriani. *Electrochemical Society, Journal,* v. 103, Mar. 1956, p. 194-201.

Details for successful operation of galvanic cells employing non-aqueous electrolytes described for both liquid and solid alloys. Applications to the determination of phase diagrams are outlined. Possibilities of obtaining surface free energies discussed. A comprehensive bibliography of galvanic cell studies of metallic systems is presented. Diagrams, graphs, tables. 95 ref. (P12, M24)

203-P. Specific Heat and Heat of Transformation of $MgCd_3$. B. M. Rosenbaum and B. Welber. *Journal of Chemical Physics,* v. 24, Feb. 1956, p. 485-486.

Specific heats were measured to investigate first and second-order transformations. Table, graph. 11 ref. (P12, N11, Mg, Cd)

204-P. Superconductivity. A. Wexler. *Metal Progress,* v. 69, Mar. 1956, p. 89-93.

At extremely low temperatures, electrical resistance decreases to an immeasurably small value and the material becomes perfectly diamagnetic. Unfortunately, the highest temperature at which superconductivity is found is 18° K., or about −430° F. Graphs, table. (P15)

205-P. Electrical Resistivity Tensor for Aluminum Single Crystals Deformed at Helium Temperature. A. Sosin and J. S. Koehler. *Physical Review,* v. 101, ser. 2, Feb. 1, 1956, p. 972-977.

Attempts to secure a simple type of deformation by making tensile tests at helium temperature and to analyze types and amounts of defect present by measuring all components of the resistivity tensor. Tables, diagrams, graphs. 6 ref. (P15, Q24, Al, He)

206-P. The Kelvin Relations in Thermo-Electricity. E. H. Sondheimer. *Royal Society, Proceedings,* v. 234,

ser. A, Feb. 21, 1956, p. 391-398.

General proof of the Kelvin relations among the thermo-electric effects in conducting crystals, the departure from equilibrium of both the electron and the lattice distribution functions being taken into account. 7 ref. (P15)

207-P. Low Temperature Research. A. Wexler. *Westinghouse Engineer,* v. 16, Mar. 1956, p. 34-38.

Reasons for studying metals at low temperatures; superconductor properties; brief summaries of some low-temperature research projects now underway. Diagrams, graphs, photograph. (P15)

208-P. Thermal Conductivity of Powder-Metallurgy Uranium. H. W. Deem and H. R. Nelson. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-745, May 1952, 15 p.

Thermal-conductivity measurements made on three powder compacts of uranium and, for comparison, on one sample of cast and wrought metal. Diagram, graph, table. 4 ref. (P11, U)

209-P. The Behavior of Ferromagnetics Under Strong Compression. F. D. Stacey. *Canadian Journal of Physics,* v. 34, Mar. 1956, p. 304-311.

Specimens in form of thin disks subjected to strong compression simultaneously with high magnetic fields by means of a newly designed permeameter. Magnetization curves extending to saturation plotted for a number of materials at pressures up to 10,000 atmospheres, the most interesting results being the strong increase in saturation shown by nickel and nickel alloys. Diagram, graphs. 16 ref.
(P16, Ni, Cu, Fe, Co, SS)

210-P. Stability Characteristics of Molybdenum Permalloy Powder Cores. C. D. Owens. *Electrical Engineering,* v. 75, Mar. 1956, p. 252-256.

Intrinsic properties and basic behavior, as well as design considerations. Graphs, diagrams, micrograph, photograph. 2 ref.
(P16, Tl, Mo)

211-P. Ferromagnetism in Relation to Engineering Magnetic Materials. F. Brailsford. *Institution of Electrical Engineers, Proceedings,* v. 103, pt. A, no. 7, Feb. 1956, p. 39-51.

Review of recent theoretical and experimental work, ferromagnetic domains and the small-particle theory of high coercivity, ferrites and ferrimagnetism, magnetic phenomena occurring at high frequencies. Diagrams, graphs, table. 34 ref. (P16, Fe)

212-P. The Mass-Transfer Properties of Various Metals and Alloys in Liquid Lead. J. V. Cathcart and W. D. Manly. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission),* ORNL-2008, Feb. 1956, 9 p.

Tests were performed on 21 metals and alloys in small, quartz thermal-convection loops at about 800° C., with a thermal gradient of 300° C. existing across the loops. Only niobium and molybdenum showed high resistance to mass transfer, while nickel and nickel-rich alloys were highly susceptible. Graphs, diagrams, micrographs. 1 ref.
(P12, Pb)

213-P. Statistics of the Three-Dimensional Ferromagnet. IV. The Face Centered and Body Centered Cubic Lattices. E. Dempsey and D. Ter Haar. *Physica,* v. 22, no. 1, Jan. 1956, p. 1-3.

Kramers' variational method used to derive the partition functions per spin for the cubic ferromagnetic structures, and these are compared with partition function derived by approximate methods. Tables. 25 ref. (P16)

214-P. On the Transport Properties of Metals and Semi-Conductors. D. Ter Haar. *Physica,* v. 22, no. 1, Jan. 1956, p. 61-68.

How simple kinetic arguments can be used to derive approximate expressions for the thermal conductivity, thermoelectric power, Hall constant and magnetoresistance of metals and semiconductors, including in some cases the contribution from lattice current. 14 ref.
(P11, P15, P16)

215-P. Effects of Pressure on the Electrical Properties of Semiconductors. Donald Long. *Physical Review,* v. 101, ser. 2, Feb. 15, 1956, p. 1256-1263.

Measurements made of effects of hydrostatic pressures from 1 to 2000 atmospheres on the electrical properties of germanium, indium antimonide, indium arsenide, gallium antimonide, tellurium and magnesium stannide. Graphs, tables. 13 ref.
(P15)

216-P. Infrared Absorption and Oxygen Content in Silicon and Germanium. W. Kaiser, P. H. Keck and C. F. Lane. *Physical Review,* v. 101, ser. 2, Feb. 15, 1956, p. 1264-1268.

Pulled silicon crystals showed an absorption at 9μ which is caused by oxygen originating from the quartz crucible. Model suggested in which oxygen atoms occupy interstitial positions and form bonds with two neighboring silicon atoms in the silicon lattice. Oxygen-free silicon has a weak lattice absorption at 9μ. Corresponding absorption at 11.6μ in germanium was found to be superimposed above a weak lattice band. Graphs, tables. 14 ref. (P17, M25)

217-P. Modulation of Conductivity by Surface Charges in Metals. G. Bonfiglioli, R. Malvano and E. Coen. *Physical Review,* v. 101, ser. 2, Feb. 15, 1956, p. 1281-1284.

Experimental technique and results obtained for gold, bismuth and antimony. Tentative interpretation of the peculiar features found. Graphs, diagrams. 10 ref.
(P15, Au, Bi, Sb)

218-P. Effect of Dislocations on the Minority Carrier Lifetime in Semiconductors. A. D. Kurtz, S. A. Kulin and B. L. Averbach. *Physical Review,* v. 101, ser. 2, Feb 15, 1956, p. 1285-1291.

Density of random dislocations in germanium and silicon crystals measured by means of X-ray rocking curves and by etch pit counting. Data obtained by the two methods were in good agreement, and dislocation densities in the range 10^4 to 10^7 per sq.cm. were found. Graphs, micrographs, table. 14 ref. (P15, M26, Si, Ge)

219-P. Thermal Expansion Coefficients for 51 Metals. W. A. Tucker. *Product Engineering,* v. 27, Mar. 1956, p. 215, 217.

Reference sheets tabulating composition and condition prior to test. Tables. (P11)

220-P. (English.) **Paramagnetic Susceptibility Measurements on PdAg Alloys.** Ebbe Kronqvist. *Arkiv för Fysik,* v. 10, no. 1, 1956, p. 49-57.

Measurements on palladium and three palladium-silver alloys from room temperature to 1000° K. Tables, graphs, diagram. 18 ref.
(P16, Pd, Ag)

221-P. (English.) **Studies on the Wetting Effect and the Surface Tension of Solids. The Change in Scratch Hardness of Metals Due to Wetting by Liquids. The Softening Effect of Wetting Water on Knife-Scouring With Whetstone.** Mizuho Sato. *Japan Academy, Proceedings,* v. 31, no. 9, Nov. 1955, p. 620-624.

Experiment shows scratch hardness is decreased by wetting with methanol, glycerin and distilled water. Graphs, micrographs. 1 ref.
(P10, Q29, ST, Al, Mg)

222-P. (French.) **Electrochemical Behavior of Vanadium. Voltage-pH Equilibrium Diagram of the System V-H_2O at 25° C.** E. Deltombe, N. de Zoubov and M. Pourbaix. *Centre Belge d'Etude de la Corrosion, Rapport Technique,* no 29, 27 p. 1956.

Conclusions are drawn relative to the general properties of vanadium and its oxides. Phase diagrams. 38 ref. (P15, V)

223-P. (French.) **Improvement by Boron Treatment of the Electrical Conductivity of Aluminum Containing Titanium or Vanadium.** A. Domony and K. R. Vassel. *Metaux, Corrosion-Industries,* v. 31, no. 365, Jan. 1956, p. 18-21.

Determination of the optimum conditions for boron treatment; formulation of a theory for refining by boron. Tables, graphs.
(P15, Ti, V, B)

224-P. (German.) **Magnetic Behavior of Intermetallic Phases of the Sodium-Thallium Type.** W. Klemm and H. Fricke. *Zeitschrift für anorganische und allgemeine Chemie,* v. 282, nos. 1-6, Dec. 1955, p. 162-168.

Investigation of magnetic behavior of NaIn, NaTl, LiAl, LiIn, LiZn and LiCd, of which some are low dia and some low para-magnetic. Tables, diagram. 8 ref. (P16, Na, Tl)

225-P. (German.) **Ferro and Anti-Ferro Magnetic Properties of the System Gold-Manganese.** Albrecht Kussmann and Ernst Raub. *Zeitschrift für Metallkunde,* v. 47, no. 1, Jan. 1956, p. 9-15.

Between 15 and 23 at. % manganese ferromagnetism, curie temperatures from + 100 to − 100° C., and maximum saturation values of 5000 Gauss were found. The phase Au_2Mn possesses anomalous magnetic properties showing a magnetization curve rising with increasing field intensity, first slowly followed by a rapid rise at high intensities up to 1700 Gauss. Table, graphs, micrographs, phase diagram. 13 ref.
(P16, M24, Au, Mn)

226-P. (German.) **Determination of Surface Tension of Rubidium From the Phenomena of Surface Diffusion.** Horst Wegener. *Zeitschrift für Physik,* v. 143, no. 5, 1956, p. 548-558.

A drop-condensate (rubidium and quartz) consists of large and small liquid drops one beside the other. In the course of time, the smaller drops coalesce into larger ones. The movement of the substances is due to the diffusion of rubidium atoms along the quartz surface. These processes can be pursued quantitatively by means of electrolytic model tests. Graphs, table, micrographs. 6 ref. (P10, Rb)

227-P. (Russian.) **Temperature Relation of the Galvanomagnetic Effect in Iron-Nickel Alloys.** D. I. Volkov and R. S. Taichinov. *Moskovskogo universiteta, vestnik, seriia fiziko-matematicheskikh i estestvennykh nauk,* v. 10, no. 12, Dec. 1955, p. 75-79.

Relation between temperature and saturation magnetostriction. Graphs. 5 ref. (P16, Fe, Ni)

228-P. (Russian.) **Adsorption of Hydrogen on Platinum-Gold Alloys.** K.

A. Lapteva, T. I. Borisova and M. G. Slin'ko. *Zhurnal Fizicheskoi Khimii,* v. 30, no. 1, Jan. 1956, p. 61-68.

Hydrogen adsorption changes little on adding gold to the platinum, up to 10%, and then falls off sharply, reaching zero for the 60% gold alloy. Tables, graphs. 13 ref. (P13, Au, Pt)

229-P. (English.) **Isothermal Measurements on the Release of Energy Stored in Cold-Worked Aluminium.** H. U. Åström. *Arkiv för Fysik,* v. 10, no. 3, 1956, p. 197-211.

A study of the release of energy from room-temperature compressed high-purity aluminum bolts, in the range from 70 to 350° C., by isothermal calorimetric measurements. Tables, graphs, micrographs. 26 ref. (P12, Al)

230-P. (English.) **New Determination of the Temperature of Gold and Silver Points on the Thermodynamic Temperature Scale.** Jiro Oishi, Mitsuru Awano and Takeshi Mochizuki. *Physical Society of Japan, Journal,* v. 11, no. 3, Mar. 1956, p. 311-321.

The freezing points of gold and silver determined by a constant volume nitrogen gas thermometer with a gas bulb made of silica glass. Diagrams, tables, graphs. 9 ref. (P12, Au, Ag)

231-P. (French.) **Law of Approximation for the Saturation of a Fe-Si Monocrystal in the Three Principal Crystallographic Directions.** M. Henri Danan. *Comptes rendus,* v. 242, no. 6, Feb. 6, 1956, p. 748-750.

For values of the lower field up to 27,000 oersteds, there is no saturation; the greatest magnetic hardness corresponds to the direction where the anisotropic energy is maximum. Diagram, graphs. 4 ref. (P16, Fe)

232-P. (French.) **Electronic Apparatus for Measuring Magnetic Susceptibilities.** Jacques Joussot-Dubien, Bernard Lemanceau and Adolphe Pacault. *Journal de Chimie Physique,* v. 54, no. 2, Feb. 1956, p. 198-205.

Easy-to-use apparatus giving results similar to those given by classic apparatus with a large constant magnetic field. Diagrams, graph, tables. 16 ref. (P16)

233-P. (Russian.) **Determination of Vapor Pressure of Solid Cobalt and Iron by Means of Radioactive Isotopes.** Iu. V. Kornev and V. N. Golubkin. *Fizika metallov i metallovendenie,* v. 1, no. 2, 1955, p. 286-297.

Measurement methods include absorption of inert gas, rate of sublimation and rate of vapor flow from a small opening. Temperature relation of vapor pressure. Diagram, tables, graphs. 19 ref. (P12, Co, Fe)

234-P. (Russian.) **Electrical Properties of InSb.** D. N. Nasledov and A. Iu. Khalilov. *Zhurnal Teknicheskoi Fiziki,* v. 26, no. 1, Jan. 1956, p. 6-14.

Hole and electron conductivity. Temperature relation of electrical conductivity from 1.3 to 673° C. Hall effect up to 30,000 oersteds, and change of resistance in magnetic fields. Graphs. 10 ref. (P15, In, Sb)

Q

Mechanical Properties and Test Methods; Deformation

284-Q. A Non-Destructive Test for Bore Hardness. David E. Driscoll and Samuel J. Acquaviva. *American Machinist,* v. 100, Feb. 27, 1956, p. 116-117.

Measurement of the bore hardness of a tube by a nondestructive method (including both standard tubing in industry and gun tubes in the Armed Forces). Photographs, diagrams, graph. (Q29, Be, Cu)

285-Q. Investigations Into Blade-Root Fixings of High-Temperature Steels. W. Siegfried. *ASME, Transactions,* v. 78, Feb. 1956, p. 327-338.

Investigations comprised long-time tests on smooth and notched specimens and on various models of blade-root fixings. Results were explained on the basis of a working hypothesis which conforms to Ludwick's theory of the embrittlement of materials at room temperature. Graphs, diagrams, photographs, tables. 4 ref. (Q3, Q23, Q26, ST)

286-Q. Factors Influencing the Notch Fatigue Strengthening of N-155 Alloy at Elevated Temperatures. W. S. Hyler and W. F. Simmons. *ASME, Transactions,* v. 78, Feb. 1956, p. 339-347; disc., p. 347-348.

Data illustrate effect of stress raisers on the elevated-temperature fatigue behavior of N-155 alloy. Data were obtained on specimens notched with V-grooves having various root radii and various notch severities. The experimental program was in direct-stress fatigue and covered a range of alternating stress to mean stress from $A = 0.0$ to $A = \infty$ at temperatures of 1200 to 1500° F. Diagrams, micrographs, graphs, tables. 11 ref. (Q7, SG-h)

287-Q. Factors Influencing the Notch-Rupture Strength of Heat-Resistant Alloys at Elevated Temperatures. R. L. Carlson, R. J. MacDonald and W. F. Simmons. *ASME, Transactions,* v. 78, Feb. 1956, p. 349-358.

Stress-rupture tests were conducted on notched and unnotched or plain bars of S-816, Inconel "X" Type 550, and Waspaloy, at temperatures ranging from 1200 to 1600° F. Test objectives were to learn under what conditions these materials respond in a brittle manner and to study factors having influence in notched and unnotched stress-rupture behavior. Diagram, graphs, micrographs, tables. 5 ref. (Q4, SG-h)

288-Q. Plasticity Equations and Their Application to Working of Metals in the Work-Hardening Range. E. G. Thomsen. *ASME, Transactions,* v. 78, Feb. 1956, p. 407-412.

Reviews equations applicable to general states of stress in forming problems. Theoretical solutions for the particular case of cold extruding 2S-O aluminum in an inverted extrusion process with negligible external friction are compared with experimental results. Graphs, table. 17 ref. (Q24, G5)

289-Q. Plastic Metalworking. E. V. Crane. *ASME, Transactions,* v. 78, Feb. 1956, p. 413-415.

Objective is to stimulate analytical thinking, coordinate it with practice and present it in usable form for the man in the field. Diagrams, photograph. 6 ref. (Q24, F general, G general)

290-Q. A Photographic Method of Obtaining Stress Trajectories. A. R. Morris. *British Journal of Applied Physics,* v. 7, Feb. 1956, p. 59-61.

Method of superimposing a set of photographs of isoclinics described. Use of grid enables stress trajectories to be easily and accurately drawn. Photographs, diagram. 3 ref. (Q25)

291-Q. The Effects of Phosphorus in Magnesium-Treated Cast Iron. K. I. Vaschenko and L. Sofroni. *Engineers' Digest,* v. 17, Feb. 1956, p. 56-58. (From *Liteinoe proizvodstvo,* 1955, no. 7, 1955, p. 12-17.)

In malleable cast iron, the phosphorus content should not exceed 0.18 to 0.20%. Collective data on the effects of phosphorus on the change in mechanical properties of magnesium-treated cast irons. Graphs, table. (Q general, CI)

292-Q. Stresses in Pressure Vessels. W. P. Kerkhof. *Engineers' Digest,* v. 17, Feb. 1956, p. 65-68. (From *De Ingenieur,* v. 67, no. 45, Nov. 11, 1955, p. W.131-W.138, and no. 46, Nov. 18, 1955, p. W.141-W.148.)

Weld defects and their influence on strength, calculation of allowable stress ranges. (To be concluded.) (Q25, Q26, K1)

293-Q. The Determination of Temperature, Stresses, and Deflections in Two-Dimensional Thermoelastic Problems. Bruno A. Boley. *Journal of the Aeronautical Sciences,* v. 23, Jan. 1956, p. 67-75.

Investigations concerning thermal stresses in plates. An analytical successive-approximation method for the solution of linear partial differential equations is presented in general terms, and then applied to the solution of two-dimensional heat and thermal stress problems. Graphs, tables. 14 ref. (Q25)

294-Q. Dependence of Young's Modulus and Internal Friction of Copper Upon Neutron Bombardment. Donald O. Thompson and David K. Holmes. *Journal of Applied Physics,* v. 27, Feb. 1956, p. 191-192.

The results of measurements of the "saturation" changes in Young's modulus and the internal friction of copper single crystals accompanying fast neutron irradiation were reported. The functional dependence of these properties on neutron bombardment has been obtained. Graph. 5 ref. (Q21, Q22, Cu)

295-Q. Dynamic Loading of Rigid-Plastic Cylindrical Shells. G. Eason and R. T. Shield. *Journal of the Mechanics and Physics of Solids,* v. 4, Feb. 1956, p. 53-71.

Loads are assumed to be greater than static collapse values and to act for a short period of time. Numercial values are obtained for rectangular and triangular pulse shapes for a ring of force and for a rectangular pulse shape for a band of uniform pressure. Graphs, diagrams. 8 ref. (Q25)

296-Q. An Experimental Study on the Fracture of Metals Under Hydrostatic Pressure. L. W. Hu. *Journal of the Mechanics and Physics of Solids,* v. 4, Feb. 1956, p. 96-103.

Experimental investigation on plastic behavior of aluminum alloy Alcoa 61S-T6 subjected to tri-axial stresses showed that fracture strength was not affected by hydrostatic pressure, but ductility decreased as hydrostatic pressure increased. Diagrams, table, graphs. 7 ref. (Q26, Al)

297-Q. Yielding in Compression of Strip Between Smooth Dies. B. B. Muvdi and K. N. Tong. *Journal of the Mechanics and Physics of Solids,* v. 4, Feb. 1956, p. 121-127.

Yielding loads determined experimentally compared with those from analysis based upon plastic-rigid theory of plasticity. Graphs, diagrams. 7 ref. (Q28, Q23, G1, ST)

298-Q. Initial Plastic Yielding in Notch Bend Tests. A. P. Green and B. B. Hundy. *Journal of the Mechanics and Physics of Solids,* v. 4, Feb. 1956, p. 128-144 + 6 plates.

Theoretical plane-strain solutions are presented for initial plastic

yielding of notched bars bent either under four-point loading or as in the Izod or Charpy tests, and having either a V-notch or a notch whose root is a circular arc. Diagrams, graphs, photographs, tables. 13 ref. (Q5, Q23, ST)

299-Q. Use of Radio-Isotopes for Measuring Tool Wear in Metal Cutting. Robert T. Hook. *Machinery, (London)*, v. 88, Feb. 10, 1956, p. 245-248.

Establishment and operation of nuclear energy laboratory for testing cutting tool materials. Photographs, graph. (Q9, G17, S19)

300-Q. Nomographs for Calculating Hot-Air Contamination of Commercial Titanium and Titanium Alloys. J. E. Reynolds, H. R. Ogden and R. I. Jaffee. *Materials & Methods*, v. 43, Feb. 1956, p. 139, 141.

Hardness charts were constructed from experimental diffusion studies. They apply to conditions in which contamination does not extend throughout the section involved. (Q29, N1, Ti)

301-Q. Aluminium-Copper-Cadmium Alloys. E. A. G. Liddiard and H. K. Hardy. *Metal Treatment and Drop Forging*, v. 23, Feb. 1956, p. 67-71.

Properties outlined and comparison made with other aluminum-copper alloys. Graphs, tables, photograph. (Q23, Q29, Al, Cu, Cd)

302-Q. A Machine For Bend Tests. M. J. W. Geenen. *Philips Technical Review*, v. 17, Mar. 1956, p. 246-248.

Design of special bending machine for testing sheet and strip metal. Other bending methods are discussed. Diagrams, photograph. (Q6)

303-Q. The Origin of Fatigue Fracture in Copper. N. Thompson, N. Wadsworth and N. Louat. *Philosophical Magazine*, v. 1, 8th ser., no. 2, Feb. 1956, p. 113-126.

Polycrystal and single crystal specimens were tested in push-pull at 1000 cycles per sec. It was shown that the fatigue crack started in a slip band inside a single grain. An electropolishing technique showed changes in the character of the slip band after 5% of the life had expired. Diagram, graph, table. 10 ref. (Q7, Cu)

304-Q. The Ductile Fracture of Polycrystalline α-Iron. N. J. Petch. *Philosophical Magazine*, v. 1, 8th ser., no. 2, Feb. 1956, p. 186-190.

Evidence that ductile fracture requires a compressive stress on the dislocation arrays close in value to that required for cleavage. Graph. 6 ref. (Q26, Q23, Fe)

305-Q. Hypo-Elasticity and Plasticity. A. E. Green. *Royal Society, Proceedings*, v. 234, ser. A, Jan. 24, 1956, p. 46-59.

A general theory of work hardening incompressible plastic materials is developed as a special case of Truesdell's theory of hypo-elasticity. 16 ref. (Q21, Q23)

306-Q. Stress Gradients in Grooved Bars and Shafts. M. M. Leven. *Society for Experimental Stress Analysis, Proceedings*, v. 13, no. 1, 1955, p. 207-213.

Major stress across the transverse section of symmetry was calculated for the cases of flat bars and shafts containing infinitely deep hyperbolic notches subjected to tension, bending, or torsion, based on Neuber's equations. Graphs, diagrams. 9 ref. (Q25)

307-Q. The Behavior of Spot Welds Under Stress. John F. Rudy, Roy B. McCauley and Robert S. Green. *Welding Journal*, v. 35, Feb. 1956, p. 65S-71S.

Relationship shown to exist between these four spot-welding parameters: failure system, weld strength, macro-geometry of cross section, and sectioned spot shear test observations. Table, diagrams, micrographs, photographs, graphs. (Q23, K3)

308-Q. The Effect of Microstructure on Notch Toughness. III. J. H. Gross and R. D. Stout. *Welding Journal*, v. 35, Feb. 1956, p. 72S-76S.

Investigation covers the notch toughness of pearlite and ferrite aggregates in a fine-grained plain carbon steel. Tables, photograph, graph, micrographs. 8 ref. (Q23, M27, CN)

309-Q. The Effect of Microstructure on the Morphology of Fracture. II. J. C. Danko and R. D. Stout. *Welding Journal*, v. 35, Feb. 1956, p. 77S-81S.

Fracture morphology investigation of a 1025 steel reveals that fracture is associated with ferrite grain boundaries and the pearlite-ferrite interfaces which are subjected to large amounts of plastic deformation. Micrographs, tables, graphs. 17 ref. (Q26, CN)

310-Q. Dependence of Steel Weld Properties on Lattice Structure. J. Heuschkel. *Welding Journal*, v. 35, Feb. 1956, p. 82S-90S.

Temperature dependence found to be different for plain low-carbon and austenitic chromium-nickel steel weld metals, being primarily influenced by the inherent lattice structure. Tables, graphs. 18 ref. (Q23, M26, K1, Cr, Ni, ST)

311-Q. Tensile-Impact Properties of Commercially Pure Titanium at Various Temperatures. O. H. Henry and B. Z. Hyatt. *Welding Journal*, v. 35, Feb. 1956, p. 99S-101S.

Welded and nonwelded specimens tested at −65, 70, and 600° F. to determine tension-impact energy, elongation, and reduction in cross-sectional area. Photograph, diagram, table. (Q6, Q27, Ti)

312-Q. Resistance of Low-Alloy Steel Plates to Biaxial Fatigue. C. E. Bowman and T. J. Dolan. *Welding Journal*, v. 35, Feb. 1956, p. 102S-109S.

The relative resistance to repeated loading of several low-alloy steels and a carbon steel are compared. Effect of notches and welds upon the fatigue properties of each material is reported. Tables, diagram, photographs, graphs. 12 ref. (Q7, ST)

313-Q. The Mechanical Properties of Quenched and Tempered Medium-Carbon Alloy Steels. J. W. Lodge and G. K. Manning. *American Iron and Steel Institute, Contributions to the Metallurgy of Steel*, no. 49, Mar. 1956, 66 p.

Results of a number of precision tests made to determine the mechanical properties of fully quenched and tempered steels. The primary purpose of investigation was to determine the effects of incomplete hardening or slack quenching on the mechanical properties of the steels. Tables, micrographs, graphs. (Q general, ST)

314-Q. Useful Friction Recorder. Philip F. Kurz. *American Journal of Physics*, v. 24, Mar. 1956, p. 174-175.

Simple and flexible apparatus for recording frictional forces and changes in such forces encountered in traversing plane surfaces. Examples of typical records. Diagrams. (Q9)

315-Q. Researches on Fatigue of Metals at Mechanical Engineering Research Laboratory. East Kilbride and C. E. Phillips. *Institution of Engineers & Shipbuilders in Scotland, Transactions*, v. 99, pt. 3, 1955-56, p. 173-192.

Review of recent research on pin joints, screw threads, effect of size of specimen, propagation of fatigue cracks and low endurance fatigue. Graphs, diagram, micrographs, photograph, table. 9 ref. (Q7, ST, SS, Al, Mg)

316-Q. Can Specimen Size Affect Tensile Testing? Edward Dugger and Alton Brisbane. *Iron Age*, v. 177, Mar. 22, 1956, p. 82-85.

Little effect is shown by unnotched specimens but notched specimens show anomalous results. Tables, diagram, graphs. (Q27)

317-Q. Bending Creep and Its Application to Beam-Columns. L. W. Hu and N. H. Triner. *Journal of Applied Mechanics*, v. 23, Mar. 1956, p. 35-42.

Procedure for evaluating creep deflection of members subjected to bending moment. Creep behavior of beam-columns of magnesium alloy FSl-F at 260° F. investigated, results compared satisfactorily with theoretical prediction. Graphs, photographs, diagrams. 10 ref. (Q5, Q3, Mg)

318-Q. Combined Stress Tests in Plasticity. Aris Phillips and Lloyd Kaechele. *Journal of Applied Mechanics*, v. 23, Mar. 1956, p. 43-48.

Tests were made on thin-walled tubes of aluminum 2S-O to get information on the validity of the incremental theories of plasticity. Results favor the theories. Graphs. 10 ref. (Q27, Al)

319-Q. The Pattern of Plastic Deformation in a Deeply Notched Bar With Semicircular Roots. L. Garr, E. H. Lee and A. J. Wang. *Journal of Applied Mechanics*, v. 23, Mar. 1956, p. 56-58.

Graphical step-by-step method is used to determine deformation of a square grid scribed on the undeformed cross section. The deformed pattern details the regions of large plastic strain and may prove useful in considering initiation of fracture cracks. Graphs, diagrams. 7 ref. (Q24)

320-Q. Stress Concentration Caused by Multiple Punches and Cracks. Michael Sadowsky. *Journal of Applied Mechanics*, v. 23, Mar. 1956, p. 80-84.

General theory of stress distribution under several punches in simultaneous action, and of stress concentration caused by several cracks; complete evaluation for case of two punches or two cracks. Graphs, diagrams. 10 ref. (Q25, Q26, Q2)

321-Q. The Stress Distribution in a Strip Loaded in Tension by Means of a Central Pin. P. S. Theocaris. *Journal of Applied Mechanics*, v. 23, Mar. 1956, p. 85-90.

Exact solution for stress distribution resulting from loading a perforated strip in tension through a rigid pin filling the hole. Influence of hole size on stress concentration. Tables, graphs. 8 ref. (Q25, Q27)

322-Q. Studies in Dynamic Photoelasticity. M. M. Frocht and P. D. Flynn. *Journal of Applied Mechanics*, v. 23, Mar. 1956, p. 116-122.

Equipment and technique for obtaining dynamic photoelastic stress patterns from arbitrary lines in plane-stress systems by means of streak photography. Photographs, diagrams, graph, table. 16 ref. (Q25)

323-Q. Properties of Gray Iron. *Materials & Methods*, v. 43, Mar. 1956, p. 141, 143.

Data on iron of classes 20, 25, 30, 35, 40, 50 and 60. (Q general, P10, CI)

324-Q. Russian Theory for Creep Fracture. (Digest of "Fracture of

Metals During Creep", by V. S. Ivanova; *Metallovedenie i obrabotka metallov*, 1955, no. 1, p. 19-26; and by I. A. Oding and V. S. Ivanova, *Doklady akademii nauk SSSR*, v. 103, 1955, p. 77-80.) *Metal Progress*, v. 69, Mar. 1956, p. 158, 160, 162.

Previously abstracted from original. See items 887-Q, 1955; 21-Q, 1956. (Q3, Q26, Ni, ST)

325-Q. The Elastic Coefficients of the Cubic System With Tables for Simplified Calculation. Hans H. Stadelmaier, W. Maurice Pritchard and John E. Grund. *North Carolina State College (Engineering School Bulletin, Industrial Information Series Bulletin no.* 60), Oct. 1955, 9 p.

Tables at 5° intervals simplify application of elastic theory of anisotropic materials. 1 ref. (Q21)

326-Q. The Tensile Properties of Zirconium at Elevated Temperatures. D. R. Brunstetter, H. P. Kling and B. H. Alexander. *Sylvania Electric Products, Inc. (U. S. Atomic Energy Commission)*, NYO-1126, Apr. 1950, 18 p.

Values of yield strength, tensile strength, elongation and Young's modulus determined on 0.015 in. diam. zirconium wire at temperatures ranging from 70 to 1000° F. Diagram, graphs, tables. 2 ref. (Q23, Q21, Zr)

327-Q. The Performance of High-Strength Pressure-Vessel Steels. J. H. Gross and R. D. Stout. *Welding Journal*, v. 35, Mar. 1956, p. 115s-119s.

Six representative high-strength steels given extensive mechanical tests to aid in determining their applicability to pressure vessels. They are found to compare favorably with the conventional, plain carbon A201 steel. Graphs, tables. 8 ref. (Q general, ST)

328-Q. V-Notch Charpy Impact Testing of Weld Metal and Heat-Affected Zone Simultaneously. William P. Hatch, Jr., and Carl E. Hartbower. *Welding Journal*, v. 35, Mar. 1956, p. 120s-126s.

Composite test provides, at least in part, a method for evaluating the relative notch-toughness characteristics of weld metal and heat-affected base metal in a natural environment. Table, graphs, diagrams. (Q6)

329-Q. (English.) **On the Characteristic of the Weakening Effect.** Mizuho Sato. *Arkiv för Fysik*, v. 10, no. 1, 1956, p. 37-44.

The weakening effect on solid bodies due to wetting by liquids and the characteristics of this remarkable effect. Graphs, diagram. 8 ref. (Q general)

330-Q. (English.) **The Wetting Effect on Quenched Carbon Steel Within Its Elastic Limit.** Mizuho Sato. *Arkiv för Fysik*, v. 10, no 1, 1956, p. 45-48.

The change in Young's modulus of a quenched carbon steel, due to wetting by several liquids, is studied experimentally. The order of magnitude of this change is the same as that observed by Benedicks in his bending tensile test. Table, graph. 4 ref. (Q21, CN)

331-Q. (English.) **Finite Torsion of Aelotropic and Composite Cylinders.** I. J. Ramakanth. *Zeitschrift fur Angewandt Mathematik und Mechanik*, v. 35, no. 12, Dec. 1955, p. 453-459.

Application of B.R. Seth's method to obtain values for the torsion of isotropic hollow cylinders and hexaganol aelotropic cylinders. Numerical results compared with those obtained by theory of the infinitely small compulsion. Tables. 3 ref. (Q1)

332-Q. (Czech.) **Use of Radiographic Measurements, of Internal Stresses in the Strength Calculation of Structures.** Miroslav Cermak. *Hutnické listy*, v. 11, no. 1, Jan. 1956, p. 21-27.

Brandenberg elasticity and strength theory of radiometric stress measuring permits measurement of real stress values. Graphs, diagrams. (Q25)

333-Q. (French.) **Fatigue Strength of Machine Parts.** R. Cazaud. *Metaux, Corrosion-Industries*, v. 31, no. 365, Jan. 1956, p. 1-17.

Endurance limits of steels and alloys, influence of transformation conditions, effect of size and shape, surface state, temperature, and corrosion. Graphs, tables, photographs. 23 ref. (Q7, ST)

334-Q. (French.) **Influence of Structure on the Mechanical Properties and Conditions of Anodic Oxidation of Oxidized and Sintered Aluminum By-Products.** J. Boghen and J. Hérenguel. *Revue de l'Aluminium*, v. 32, no. 227, Dec. 1955, p. 1117-1124; disc., p. 1124.

Properties and creep resistance of oxidized sintered aluminium semi-finished products are primarily influenced by their structure. Effect on tensile strength, proof stress and hardness increase, as well as creep resistance, as the powder thickness lessens. Graphs, micrographs. 13 ref. (Q general, Al)

335-Q. (German.) **Creep Law of Multicrystalline Metals.** U. Dehlinger, J. Diehl and J. Meissner. *Zeitschrift für Naturforschung*, v. 11a, no. 1, Jan. 1956, p. 37-41.

General linear law of the speed of plastic deformation and relationship between stress and elongation. Experimental proofs by tension-torsion tests with arbitrary rotation of axis of the stress tensor. Graphs. 12 ref. (Q3)

336-Q. (Polish.) **Effect of Alloy Additions on the Properties of Patented Steel Wire.** Zygmunt Steininger. *Hutnik*, v. 22, no. 9, Sept. 1955, p. 306-313.

Effect of various elements and gases, patenting temperature, and other factors on curves of isothermal transformation of austenite. Bainitic-ferritic, pearlitic, and other structures. Micrographs, graphs. 6 ref. (Q general, N8, J25, CN)

337-Q. (Polish.) **Use of Spheroidal Cast Iron as a Wear-Resistant Material.** Mieczyslaw Pachowski. *Przeglad odlewnictwa*, v. 6, no. 1, Jan. 1956, p. 10-12.

Economy of using spheroidal cast iron for rams and crushing hammers, and its wear-resistance, as compared with manganese cast steel. Table, graphs, diagrams. 3 ref. (Q9, T28, CI)

338-Q. (Russian.) **Problem of the Constants of Elasticity and the Coefficient of Lateral Deformation. Calculation of Large Deformations.** G. P. Zaitsev. *Fizika metallov i metallovedenie*, v. 1, no. 2, 1955, p. 193-205.

A new constant of elasticity, independent of the magnitude of elastic deformation is proposed which establishes a coefficient of lateral deformation for elastic, plastic and elastoplastic deformations. Graphs, tables. 12 ref. (Q21, Q24)

339-Q. (Russian.) **Absorption of Energy at Low-Temperature Deformation of Metals.** V. I. Khotkevich, E. F. Chaikovskii and V. V. Zashkvara. *Fizika metallov i metallovedenie*, v. 1, no. 2, 1955, p. 206-218.

Impulse method of microcalorimetric measurements developed for studying the concealed energy of deformation of metals plastically deformed at 77° K. Relation of concealed energy of deformation to resistivity and other factors. Photographs, graphs, diagrams. 13 ref. (Q24, Cd, Pb)

340-Q. (Russian.) **Study of Cold Brittleness of Iron and Steel in Relation to Grain Size and Chemical Composition.** E. M. Shevandin and I. A. Razov. *Fizika metallov i metallovedenie*, v. 1, no. 2, 1955, p. 219-230.

Various heat treated specimens tested for mechanical properties to clarify the relation of temperature coefficient of plasticity to grain size, of change in creep limit to change in plasticity, with decrease of temperature, and of hardening coefficient to plasticity. Tables, graphs, diagrams. 16 ref. (Q23, ST, AY)

341-Q. (Russian.) **Irreversible Temper Brittleness of Structural Alloy Steels.** E. N. Sokolkov and V. D. Sadovskii. *Fizika metallov i metallovedenie*, v. 1, no. 2, 1955, p. 359-361.

Variation of hardness, impact toughness, intensity of magnetization and growth of coercive force at the Curie point of the magnetic phase, in relation to tempering temperatures. Graphs. 7 ref. (Q23, P16, J29, AY)

342-Q. (Russian.) **Effect of Deoxidation by Aluminum on the Irreversible Temper Brittleness of Structural Alloy Steels.** E. N. Sokolkov, G. V. Gaidukov and V. D. Sadovskii. *Fizika Metallov i Metallovedenie*, v. 1, no. 2, 1955, p. 366-367.

Relation of impact toughness to tempering temperature, with various aluminum additions. Graphs. 4 ref. (Q23, J29, AY, Al)

343-Q. (Russian.) **Relation Between Intensity of Stresses and Intensity of Deformations for Certain Metastable Alloys.** T. N. Martynova. *Moskovskoga universiteta, vestnik, seriia fiziko-matematicheskikh i estestvennykh nauk*, v. 10, no. 12, Dec. 1955, p. 29-36.

Experimental results render more precise the law of hardening, in the theory of small elasto-plastic deformations. Mechanical properties, including hardness, of aluminum, magnesium, and toolsteel specimens, subjected to compression, tension and torsion tests. Table, graphs. 7 ref. (Q general, Al, Mg, TS)

344-Q. (Russian.) **More on the Problem of the Cylindrical Form of the Loss of Stability of Elastoplastic Sheets.** Iu. R. Lepik. *Prikladnaia Matematika i Mekhanika*, v. 20, no. 1, Jan.-Feb. 1956, p. 140-143.

Equations for theory of loss of bearing capacity in flat sheets or bars stressed beyond the elastic limit. Mechanism and forms of curling, sagging and buckling. Graphs. 7 ref. (Q28, Q21)

345-Q. (Russian.) **Conditions Under Which Fibrous Fracture Occurs in Steels.** N. K. Ipatov. *Stal'*, v. 16, no. 1, Jan. 1956, p. 51-53.

Attempts to identify the causative mechanism of the fractures by testing various heat treated specimens, representing an extremely broad range of microstructures. Micrographs. (Q26, J general, M27, ST)

346-Q. (Russian.) **Test Results, Under Actual Use Conditions, for a New Antifriction Alloy, SOS6-6.** A. V. Lakedemonskii, V. B. Pogozhev, N. M. Rudnitskii and I. E. Fokin. *Vestnik mashinostroeniia*, v. 36, no. 1, Jan. 1956, p. 55-56.

New alloy is considered better for bearings, under high speed and pressure conditions in gasoline engines, than high-tin or lead babbitt metal. Composition, physical properties,

microstructure and economy of this alloy. Photograph, micrograph, table. (Q9, Q general, Pb)

347-Q. (Russian.) **Problem of Wear Resistance and Hardness of Electro-Chromium Coatings.** A. V. Shreider. *Zhurnal Prikladnoi Khimii,* v. 29, no. 1, Jan. 1956, p. 73-82.

Hardness and wear-resistance indicators for chromium platings determined; peculiarities in relation to hardness and wear resistance explained. Microhardness method suggested as a quick way of determining wear resistance. Graphs, diagram. 20 ref. (Q29, Q9, Cr)

348-Q. Developments in Fatigue Crack Detecting Systems. S. R. Valluri. *California Institute of Technology, Southern California Cooperative Wind Tunnel Report No. P-5,* July 1955, 26 p.

Investigation of reliability of the wire type system. Basic principles of propagation of a fatigue crack; surface, wire and adhesive used to attach wire to surface; installation techniques, equipment and location of failures. Tables, graphs, photographs, diagram. 13 ref. (Q7, W, Cu, Ni)

349-Q. Effect of Carbide-Forming Elements on Temper Embrittlement of Steel. V. I. Prosvirin and E. I. Kvashnina. *Henry Brutcher Translation No.* 3560, 20 p. (From *Vestnik Mashinostroeniya,* v. 35, no. 2, 1955, p. 58-67.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 421-Q, 1955. (Q23, M26, ST)

350-Q. Nitrogen-Alloyed High-Chromium Steels. A. Semkowicz. *Henry Brutcher Translation No.* 3626, 7 p. (Abridged from *Hutnik,* v. 22, no. 1, 1955, p. 8-12.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 604-Q, 1955. (Q23, Q29, J general, R general, AY)

351-Q. Effect of Plastic Deformation in the Austenitic State Upon Temper Embrittlement of Alloy Structural Steels. L. V. Smirnov, E. I. Sokolov and V. D. Sadovskii. *Henry Brutcher Translation No.* 3672, 4 p. (From *Doklady Akademii Nauk SSSR,* v. 103 no. 4, 1955, p. 609-610.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 1038-Q, 1955. (Q24, Q25, ST)

352-Q. (French.) **Deformation Mechanics in Metals.** L. Habraken and T. Greday. *Revue Universelle des Mines,* v. 12, ser. 9, no. 2, Feb. 1956, p. 38-55.

Present status of physical metallurgy in the field of metal deformation, based on various X-ray and microscopic studies. Essential differences between the behavior of monocrystals and polycrystalline aggregates. Theoretical interpretation of deformation within the theory of dislocations. Diagrams, tables, photographs, graphs, micrographs. 50 ref. (Q24)

353-Q. (German.) **Further Foreign Investigations and Considerations of Brittleness of Steel.** Karl Rühl. *Archiv für das Eisenhüttenwesen,* v. 27, no. 2, Feb. 1956, p. 107-118.

Review of foreign literature. Outline for construction of a theory on the subject. Tables, graphs, diagrams, photographs. 50 ref. (Q23, ST)

354-Q. (German.) **Hardness Determinations With Small Loads. I. Fundamentals, and Effects on Measurements.** H. Wiegand, M. Kock and H. J. Meyer. *Metalloberfläche,* v. 10, no. 2, Feb. 1956, p. 35-39.

Fundamentals of Vickers hardness test. Relationship between micro and macrohardness measurement. Graphs, diagrams, micrograph. (Q29)

355-Q. (Japanese.) **Studies on Mechanical Properties at Elevated Temperature of Timken 16-25-6. II.** Taro Hasegawa, Osamu Ochiai and Junichi Ino. *Iron & Steel Institute of Japan, Journal,* v. 42, no. 2, Feb. 1956, p. 116-120.

Effects of solution treatment before hot cold working, working temperature, and amount of work on creep rupture properties at 650° C. and 31.5 kg. per sq. mm. Tables, graphs, micrographs. 3 ref. (Q3, SG-h)

356-Q. (Russian.) **Laboratory Methods for Determining the Tendency of Steel to Brittle Fracture.** Ia. M. Potak. *Zavodskaia Laboratoriia,* v. 22, no. 2, Feb. 1956, p. 208-217.

Types of brittle fracture. Study of this tendency with and without the action of surface-active or corrosive media. Effect of prior heat treatment, especially tempering temperature, and of shape and localization of stresses. Graphs, diagrams. 11 ref. (Q23, ST)

357-Q. (Book.) **Advances in Applied Mechanics.** H. L. Dryden and Th. von Karman, editors. v. IV. 413 p. 1956. Academic Press Inc., 125 East 23rd St., New York 10, N. Y. $10.00.

Theory and characteristics of boundary layers, elastic and plastic phenomena and fatigue properties of materials. (Q7, Q21, Q24, M26)

358-Q. (Book.) **Society for Experimental Stress Analysis, Proceedings** (Annual Volume), v. 13, no. 1, 1955, 213 p. Society for Experimental Stress Analysis, Central Square Station, P.O. Box 168, Cambridge 39, Mass.

Fundamentals of strain gages, stresscoat and other devices and techniques. (Q25)

359-Q. (Book—German.) **Text and Handbook of Engineering. XVII. Problems of the Plasticity Theory.** William Prager. 1955. 100 p. Birkhäuser Verlag, Basel, Switzerland. $3.15.

Mechanical behavior of plastic solids and of structures in the plastic range; methods of determining the load-carrying capacity of various types of rigid, perfectly plastic structures; finite plastic deformations. (Q23)

360-Q. (Book—German.) **Manual for Practical Material Testing in the Metal Industry.** O. Niezoldi. 4th Rev. Ed. 123 p. 1955. Springer-Verlag, Berlin, Germany.

Testing methods, determination of strength, hardness, flexibility and notch impact strength, weld joint testing. (Q general)

R

Corrosion

172-R. Corrosion Control Pays Off. T. L. Canfield. *American Gas Journal,* v. 183, Mar. 1956, p. 11-14.

In a distribution and transmission system assembled with a variety of facilities including all kinds of pipe and construction practices, the problems of providing adequate protection against corrosion are myriad. How a company is providing this protection is outlined. Drawing. (R10, L26)

173-R. Stress Corrosion of Austenitic Stainless Steels in High Temperature Waters. W. Lee Williams and John F. Eckel. *American Society of Naval Engineers, Journal,* v. 68, Feb. 1956, p. 93-104.

Deals with some aspects of stress corrosion of austenitic stainless steels when exposed to high temperature, water and steam. Graphs, diagram, photographs, micrographs, table. 28 ref. (R1, SS)

174-R. Navy Experimental Work With Cathodic Protection. Irving D. Gessow. *Corrosion,* v. 12, Mar. 1956, p. 18-23; disc., p. 23-24.

An account of work done by the Navy Bureau of Ships with cathodic protection of active and reserve ships. Photographs, tables. (R10)

175-R. Dealuminization of Aluminum Bronze. Mortimer Schussler and D. S. Napolitan. *Corrosion,* v. 12, Mar. 1956, p. 25-30.

Studies were carried out on samples of single and two-phase aluminum bronzes which were exposed to aqueous hydrofluoric acid, the corrosive agent to which the valve failures were affixed. Diagrams, micrographs, photographs. 1 ref. (R5, Cu)

176-R. Positive-Polarity Grounding of Direct Current Supply Requirements in Mining Traction Systems. Sidney A. Gibson. *Corrosion,* v. 12, Mar. 1956, p. 37-40.

Corrosion of mine traction systems using positive-polarity grounding of direct current supply equipment described. Abnormally increased costs from excessive trolley insulator failures and a safety hazard resulting from possible formation of pure metallic sodium or potassium in corrosion products. Photographs. 2 ref. (R8)

177-R. Oxide Films on Stainless Steels. Thor N. Rhodin. *Corrosion,* v. 12, Mar. 1956, p. 41-52; disc., p. 53.

Compositional properties of oxide films isolated from surfaces of stainless steels were studied using specially developed micro-analytical techniques. Properties of passive films on stainless steel were evaluated. Effects of alloy composition and surface treatment on other types of films on Types 304, 316 and 347 stainless steels were studied. Diagrams, graphs, micrographs, photograph, tables. 31 ref. (R10, L19, SS)

178-R. Methods of Preventing Corrosion in Sewerage Systems. Ervin Spindel. *Corrosion,* v. 12, Mar. 1956, p. 54-58.

Relative merits and application techniques of chemical additives. Recommendations concerning control through design to increase velocity or eliminate vapor space are weighed. Diagram, photographs. 9 ref. (R10)

179-R. A Bibliography of Corrosion by Chlorine. *Corrosion,* v. 12, Mar. 1956, p. 59-66.

This report contains 86 abstracts of papers on corrosion by chlorine. It is indexed by materials and coded by the NACE Abstract Code. 21 ref. (R9)

180-R. Field Practices for Controlling Water-Dependent Sweet Oil Well Corrosion. *Corrosion,* v. 12, Mar. 1956, p. 67-71.

Use of the following devices on flowing wells: injection valves, side-door chokes, tapered tubing and special equipment. Consideration is given also to minimizing corrosion in gas lift wells and in pumping wells. Accounts of the use of plastic coated and special alloy tubing given. (R7)

181-R. Corrosion Problems at Stanlow Refinery. D. H. Nicholson. *Corrosion Prevention and Control,* v. 3, Feb. 1956, p. 37-39.

Types of corrosion in distillation and other equipment, hydrogen sulfide problems, graphitic softening of cast iron. Photograph.
(R7, ST, CI)

182-R. The Surface Preparation of Ferrous Metals. J. Idger. *Industrial Finishing (London),* v. 9, Feb. 1956, p. 386. (Translated from *La Metallurgie,* v. 87, no. 2.)

Choice of preparation method dependent upon object in view and type of work to be treated. Discusses scale and oxide films. (To be continued.) (R2, L12)

183-R. The Prevention of the Corrosion of Ferrous Metals. J. C. Hudson. *Institution of Electrical Engineers, Journal,* v. 2, Feb. 1956, p. 84-88.

Mechanism of corrosion rust prevention by alternations in corrosive medium, design or composition of metal, application of protective coatings, cathodic protection. Graph, micrographs, photographs. 8 ref.
(R general, L general, Fe, ST)

184-R. Enhanced Oxidation of Platinum in Activated Oxygen. George C. Fryburg. *Journal of Chemical Physics,* v. 24, Feb. 1956, p. 175-180.

An enhanced oxidation of platinum was observed in moist activated oxygen. Cause of this enhancement investigated. Diagrams, graphs, tables. 17 ref. (R2, Pt)

185-R. Predicting Corrosion Resistance by Microscopic Examination. John H. Scott. *Metal Progress,* v. 69, Mar. 1956, p. 79-80.

Stainless steel plates which must pass a 240-hr. nitric acid corrosion test can be released while the test is in progress by use of a quick microscopic screening method. Micrographs. (R11, SS)

186-R. Pitfalls to Avoid in the Design of a Cathodic Protection System. Wayne A. Johnson. *Pipe Line Industry,* v. 4, Mar. 1956, p. 24-26.

Consideration of these pitfalls will save money initially, cut operating expense, insure maximum efficiency. Graphs, diagrams. (R10)

187-R. The Gas-Oxide Interface and the Oxidation of Metals. T. B. Grimley and B. M. W. Trapnell. *Royal Society, Proceedings,* v. 234, ser. A, Feb. 21, 1956, p. 405-418.

Emphasizes importance of structure of the surface layer of oxygen adsorbed at the oxide-oxygen interface in determining the laws of growth of thin oxide films on metals. Graph. 17 ref. (R2, L19, Cu, Al)

188-R. Aluminium in Contact With Other Materials. *Aluminium Development Association, Information Bulletin No.* 21, Dec. 1955, 48 p.

Causes and types of corrosive attack, principles of preventing attack, behavior of aluminium in contact with specific materials. An appendix summarizes the nature of metallic corrosion. Tables, photographs, diagrams. 7 ref.
(R general, Al)

189-R. Effects of Water Quality on Various Metals. Lee Streicher. *American Water Works Association, Journal,* v. 48, Mar. 1956, p. 219-238.

Effects of Colorado River water on corrosion of several subscribing municipal systems. Tables, graphs, photographs. 3 ref. (R4)

190-R. Effects of Softened Water on Equipment. Loring E. Tabor. *American Water Works Association, Journal,* v. 48, Mar. 1956, p. 239-246.

Serious dezincification of value stress is caused by softening. Low-zinc bronzes are now specified. Tables, graph, diagrams. 1 ref.
(R2, R4, Cu)

191-R. The Corrosion of Thorium. J. E. Draley. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-4908, Oct. 1952, 23 p.

A project literature search disclosed considerable inconsistency in the aqueous corrosion of thorium, depending on metal source and sample preparation. Graphs, tables. 11 ref. (R5, Th)

192-R. The Corrosion of Low-Zirconium Uranium Alloys in Boiling Water. J. E. Draley, J. W. McWhirter, F. Field and J. Guon. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5030, Apr. 1953, 56 p.

Alloys containing 5 or 6 wt. % zirconium form good protective oxide films under certain conditions. Diagrams, graphs, micrographs, photographs, tables. 6 ref. (R4, U)

193-R. Corrosion Testing at High Temperatures. N. D. Greene, Jr. *Chemical Engineering,* v. 63, Apr. 1956, p. 175-180.

Problems involved in selection of materials for use at high temperatures, testing methods, application of test results. Table, diagrams, photographs. 5 ref. (R11)

194-R. The Prevention of Fretting Corrosion. R. B. Waterhouse. *Corrosion Prevention and Control,* v. 3, Mar. 1956, p. 37-39.

This corrosion develops when two surfaces in contact and nominally at rest with respect to each other, experience slight periodic relative movement. 16 ref. (R1)

195-R. The Dissolution of Zirconium and Corrosion of Stainless Steel in Sulfuric Acid and Nitric-Hydrofluoric Acid Mixtures. R. H. Gercke and D. Lewis. *Livermore Research Laboratory (U. S. Atomic Energy Commission),* AECD-3702, Jan. 1954, 11 p.

Results of tests in various concentrations of the acids and at various temperatures. Tables.
(R2, R5, Zr, SS)

196-R. Summarizing Report on Stress Corrosion of Beryllium. Hugh L. Logan and Harold Hessing. *National Bureau of Standards (U. S. Atomic Energy Commission),* NBS-6, Dec. 1955, 11 p.

Stress-corrosion tests were made on beryllium in a circulating 0.002 to 0.006 molar hydrogen peroxide solution at a temperature of 85 to 93° C. There was no evidence of stress-corrosion cracking in any of the specimens tested. Diagrams, photographs, micrograph, tables.
(R1, Be)

197-R. Galvanic Corrosion Properties of Titanium in Organic Acids. David Schlain, Charles B. Kenahan and Doris V. Steele. *U S. Bureau of Mines, Report of Investigations* 5189, Jan. 1956, 17 p.

Acids used were 10% formic, acetic, lactic and citric, 1% oxalic and tartaric and 9% oxalic. Electrode-potential measurements and several types of galvanic couple experiments were carried out. Solutions were aerated by flow of air, flow of helium and natural aeration, at 35° C. with couples consisting of equal areas of two metals. Tables, graphs, diagram. 8 ref.
(R7, R1, Ti, Cu, SS, Al)

198-R. (German.) **The Influence of Impurities on the Corrosion Resistance of Aluminum.** P. Brenner, F. E. Faller and E. Höffler. *Aluminium,* v. 32, no. 1, Jan. 1956, p. 6-12.

Strips 1 mm. in thickness, annealed, semihard and homogenized, were tested for strength before, during and after exposure to corrosive agents. Tests lasted from six months to two years according to type of test. Macroscopic and microscopic examinations were made. Micrographs, graphs, tables. 7 ref.
(R11, Al)

199-R. (German.) **Causes of Corrosion. II.** H. Grubitsch. *Chemie-Ingenieur-Technik,* v. 28, no. 1, Jan. 1956, p. 9-24.

The corrosion processes of the system metal-solution, with special reference to the fundamentals and phenomena of the primary reactions of acid corrosion. A further concluding report will deal with the corrosion by neutral electrolyte solutions. Graphs, diagrams, table. 396 ref. (R5)

200-R. (German.) **Special Corrosion Phenomena in Precision Fuses.** A. Deman. *NTZ; Nachricht in technische Zeitschrift,* v. 9, no. 1, Jan. 1956, p. 19-20.

Serious corrosion damage was observed on precision fuses, the cause of which was found to be due to a rise in the melting temperature originating from the formation of local Ag-Cd elements. Micrographs. 2 ref. (R1, R2, Ag, Cd)

201-R. (German.) **Transformation and Equilibrium States in Alkali-Hydroxide Melts. I. Effect of Alkali-Hydroxide-Melts on Gold, Silver and Platinum.** Hermann Lux and Titus Niedermaier. *Zeitschrift für anorganische und allgemeine Chemie,* v. 282, nos. 1-6, Dec. 1955, p. 196-209.

Investigation of effect of melts at 410° C., with a definite oxygen and hydrogen content in the gas-phase. Tables, diagrams. 12 ref.
(R6, Ag, Au, Pt)

202-R. (German.) **Stress-Corrosion.** Kurt Matthaes. *Zeitschrift für Metallkunde,* v. 47, no. 1, Jan. 1956, p. 37-42.

Stress corrosion cracks in steel, magnesium and aluminium alloys, and brass. Chemical attack, the influence of time of exposure, concentration of attacking agent and of temperature. Table, graphs, diagrams. 13 ref. (R1, ST, Mg, Cu, Al)

203-R. (German.) **Corrosion and Electrochemistry.** G. Valensi. *Zeitschrift für Metallkunde,* v. 47, no. 1, Jan. 1956, p. 50-52.

Contribution to the definition of terms concerning chemical and electrochemical corrosion. 18 ref.
(R general)

204-R. (Russian.) **Conditions of Intensity of Cavitation Erosion.** K. K. Shal'nev. *Izvestiia Akademii Nauk SSSR, Otdelenie Teknicheskikh Nauk,* 1956, no. 1, Jan. 1956, p. 3-20 + 6 plates.

Peculiarities of cavitation erosion of hydraulic equipment, particularly turbines. Effect of hydrodynamic factors. Micrographs, photographs, graphs, diagrams, tables. 83 ref.
(R2)

205-R. Corrosion Problems in Pumping Acid Mine Water. G. Reinberg. *American Institute of Mining Metallurgical and Petroleum Engineers, Preprint,* 1956, Feb. 1956, 8 p.

Origin and control of principal types of erosive and corrosive pump damage. Corrosion problems in Peruvian mine pumping equipment. 1 ref. (R4)

206-R. Phenomena Resembling Stress Corrosion Cracking in Steel Under Load Induced by Diffusion of Hydrogen. I. Class. *Henry Brutcher Translation No.* 3538, 21 p. (Abridged from *Werkstoffe und Korrosion,* v. 6, no. 5, 1955, p. 237-245.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 326-R, 1955.
(R1, AY, ST)

207-R. On The Intergranular Corrosion of Austenitic Chromium-Nickel Steel. E. Brauns and G. Pier. *Henry Brutcher Translation No.* 3662, 16 p. (Condensed from *Stahl und Eisen,* v. 75, no. 9, 1955, p. 579-586.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 246-R, 1955. (R2, SS)

208-R. (French.) **The Rate of Dissolution of Nickel in Nitric Acid.** T. G. Owe Berg. *Journal de Chimie Physique,* v. 54, no. 2, Feb. 1956, p. 154-162.

Rate was measured from 0 to 65° C. for concentrations between 0.025 *N* and 14.5 *N*. Below 3.5 *N*, the rate of dissolution is proportional to the square root of the concentration. Above 9 *N*, the results are very complex and difficult to reproduce. Tables, graphs. 3 ref. (R2, Ni)

209-R. (French.) **The Rates of Dissolution of Iron and Iron-Chromium Alloys in Nitric Acid.** T. G. Owe Berg. *Journal de Chimie Physique,* v. 54, no. 2, Feb. 1956, p. 163-168.

The rates of dissolution in nitric acid of soft steel and iron-chromium alloys were measured between 0.25 *N* and 10 *N*. The soft steel and alloys with ½, 1 and 2% chromium dissolve like Armco iron, the adsorption of the reagents governing the rate. For the other alloys, the rate of dissolution is proportional to the square root of the acid concentration. Tables, graphs. 2 ref. (R2, CN, AY)

210-R. (German.) **The Effect of Impurities on Corrosion Resistance of Aluminum.** P. Brenner, F. E. Faller and E. Höffler. *Aluminium,* v. 32, no. 2, Feb. 1956, p. 64-70.

Results of macroscopic and microscopic tests on specimens in the original state and after weathering, repeated immersion and rotated corrosion tests. Corrosion effect on mechanical properties. Copper reduces corrosion most, then iron, next silicon. Micrographs. 7 ref. (R11, Q general, Al)

211-R. (German.) **The Corrosion of Aluminum Structural Parts of a German Escort Vessel Sunk During the War.** F. E. Faller. *Aluminium,* v. 32, no. 3, Mar. 1956, p. 136-138.

Study of the effect of 7-yr. total immersion in sea water on wheelhouse superstructure, wheelhouse roof and top bulwark, constructed of AlCuMg F-38 clad sheet and 99.5% Al sheets; section, bars and rivets of AlMg7; and window frames of AlSi casting alloy. Only slight corrosion is shown. Photograph, micrographs. (R4, T22, Al)

212-R. (German.) **Electrical Corrosion Protection of Buried Cables and Pipes.** Heinrich Riedel. *Elektrotechnische Zeitschrift,* v. 77, Ausgabe A, no. 5, Mar. 1956, p. 129-136.

Apparatus and devices used in cathodic protection processes. Graphs, diagrams. 22 ref. (R10)

213-R. (German.) **A Survey of the Methods and Specifications of Accelerated Tests in the Climatic Testing Procedure.** Artur Kutzelnigg. *Werkstoffe und Korrosion,* v. 7, no. 2, Feb. 1956, p. 65-82.

A tabulated review of the climatic testing methods, published in German and foreign literature. Tables. 180 ref. (R11)

214-R. (Russian.) **Effect of the Temperature Factor on the Rate of Corrosion of Metals in Electrolytes.** V. V. Gerasimov, G. V. Akimov and I. L. Rozenfel'd. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk,* 1956, no. 1, Jan. 1956, p. 12-15.

Studies of iron-zinc, copper-iron, copper-zinc and copper-magnesium couples in salt solutions or hydrogen peroxide. Graphs, tables. 4 ref. (R1, R5, Fe, Zn, Cu, Mg)

215-R. (Russian.) **Mechanism of Inhibitor Action.** L. I. Kashtanov and N. V. Kazanskaia. *Zhurnal Obshchei Khimii,* v. 26, no. 1, Jan. 1956, p. 184-186.

Retardation of corrosion in oxidation reactions. Inhibitors studied include hydroquinone, aniline, phenol, naphthylamines and others. Tables. 27 ref. (R10)

216-R. (Russian.) **Some Regularities in the Phenomena of the Electrical Erosion of Metals During Low-Voltage Discharge in a Liquid.** I. G. Nekrashevich and S. P. Mitkevich. *Zhurnal Teknicheskoi Fiziki,* v. 26, no. 1, Jan. 1956, p. 90-95.

Breakdown or erosion of electrodes during low-voltage condenser discharge in transformer oil. An approximate quantitative expression is developed for erosion during discharge between electrodes of the same metal, and of different metals. Tables, graph. 3 ref. (R1, Pb, Zn, Cu, Co, Ni, Fe, Al, Cr, W)

S

Inspection and Control

165-S. Profile-Inspection. *Aircraft Production,* v. 18, Mar. 1956, p. 112-115.

The Probograph, a special electrical-electronic instrument designed for inspection of aerofoil profiles of gas turbine blades is based upon the principle of measuring the workpiece at points dimensioned on the part-drawing. Photographs, diagrams. (S14)

166-S. How to Get More Range From an Air Gage. L. E. Abbott and A. F. Pomeroy. *American Machinist,* v. 100, Feb. 27, 1956, p. 113-115.

Equipment and methods for measuring diameter of round copper wave-guide pipe for transmission lines. Diagrams, photographs. (S14, Cu)

167-S. Measuring Gear Tooth Wear. George Uberti. *American Society of Naval Engineers, Journal,* v. 68, Feb. 1956, p. 151-153.

Extensive tests of both conventional and advanced types of ship main reduction gears are conducted at the U. S. Naval Boiler and Turbine Laboratory. Each step in testing followed by thorough examination of pertinent gear parts. Graphs, diagrams, photograph. (S14, Q9)

168-S. Electrical Inspection of Steel Pipe Coatings. S. Mark Davidson. *American Water Works Association, Journal,* v. 48, Feb. 1956, p. 121-130.

Electrical inspection of coatings confined to specified coal tar-enamel coatings. Photographs, table. 5 ref. (S13, L26, ST)

169-S. Analysis of Samples Containing Uranium, Niobium, and Zirconium. Philip J. Elving and Edward C. Olson. *Analytical Chemistry,* v. 28, Mar. 1956, p. 338-342.

Importance of reasonably rapid, simple and accurate methods for analysis of mixtures containing uranium, niobium and zirconium prompted an investigation of polarographic and amperometric procedures for this purpose. Tables, graphs. 20 ref. (S11, U, Cb, Zr)

170-S. Determination of Hydrogen in Titanium Metal by Hot Extraction. R. K. Young and D. W. Cleaves. *Analytical Chemistry,* v. 28, Mar. 1956, p. 372-374.

Data bearing on the precision and accuracy of the hot extraction method accumulated by miscellaneous tests on variety of titanium samples, sponge, sheet, ingot drillings and solid pieces. Graph, table, diagrams. 11 ref. (S11, Ti)

171-S. Photometric Determination of Boron in Titanium and Its Alloys. R. C. Calkins and V. A. Stenger. *Analytical Chemistry,* v. 28, Mar. 1956, p. 399-402.

The carminic acid method incorporates the precision of a photometric method into the determination of small amounts of boron but requires complete elimination of the titanium. Conditions have been found under which this may be done by cation exchange removal of the peroxy-titanium (IV) complex. Graph, tables, diagram. 7 ref. (S11, Ti, B)

172-S. Polarographic Determination of Cobalt in Presence of Nickel. Louis Meites. *Analytical Chemistry,* v. 28, Mar. 1956, p. 404-406.

Determination involves oxidation of cobalt (II) in an ammoniacal ammonium chloride solution of the sample to the + 3 state with excess permanganate, followed by destruction of the latter with excess hydroxylammonium sulfate. Tables, graph. 8 ref. (S11, Zn, Ni, Co)

173-S. Ultraviolet Spectrophotometric Determination of Zirconium. Richard B. Hahn and Leon Weber. *Analytical Chemistry,* v. 28, Mar. 1956, p. 414-415.

Zirconium tetramandelate dissolves in aqueous ammonia, forming a soluble, saltlike compound that exhibits maximum absorbance at a wave length of 258 mμ. This is used as the basis of a spectrophotometric method for the determination of milligram amounts of zirconium in the presence of aluminum, iron and titanium. Graph, table. 2 ref. (S11, Zr, Al, Fe, Ti)

174-S. Application Trends: Control in the Steel Industry. I. A. S. Urano. *Automatic Control,* v. 4, Feb. 1956, p. 13-15.

Applications of control techniques in individual steelmaking, rolling and processing systems, and in combinations of systems where feasible. Photograph, diagrams. (To be continued.) (S18, F23, D5, ST)

175-S. Continuous Gaging in Steel Mills Produces Profit. A. S. Urano. *Automation,* v. 3, Mar. 1956, p. 52-57.

Automation developments in X-ray and width gages for hot strip mills, and automatic gage control for cold rolled strip. Diagrams, photographs, graphs. (S14, F23, ST)

176-S. Ultrasonic Gauging of Hollow Propellers. *Communications and Electronics,* v. 3, Mar. 1956, p. 127-129.

Equipment and method used for checking dimensions of cores for aircraft propellers and for checking the propellers during fabrication. Photographs, diagrams. (S14)

177-S. Plating Thickness by the Attenuation of Characteristic X-Rays. Paul D. Zemany and Herman A. Liebhafsky. *Electrochemical Society, Journal,* v. 103, Mar. 1956, p. 157-159.

Attenuation by iron foil or a characteristic line from either silver or zirconium as substrate was measured in a spectrograph provided with a good collimator and with an analyzing crystal. Results, when corrected for background, show the exponential absorption law is followed closely. Graph, tables. 11 ref. (S14, L17, Ag, Zr)

178-S. Sampling Iron for Carbon Determination. William B. Sobers. *Foundry,* v. 84, Feb. 1956, p. 87-91.

Correct sampling methods are important in providing uniform representative specimens for analytical determination. Photographs, tables, micrographs. 2 ref. (S11, Fe)

179-S. Get Better Grinds With New Control Unit. L. J. Torn. *Iron Age,* v. 177, Mar. 15, 1956, p. 87-89.

A new electronic control unit can be fitted on your present automatic grinder in a matter of a few hours; built for precision, its circuitry is designed to insure a maximum of repeat accuracy. Diagram, photographs. (S14, G18)

180-S. Use of the Spectrograph in Fabrication Shops. Howard E. Boyer and Frank E. Fitzgerald. *Iron and Steel,* v. 29, Feb. 1956, p. 65-69.

The principles and operation of the spectrograph in a metal fabricating shop; limitations and advantages of the apparatus. Diagrams, ultraviolet spectra, photographs, table. (To be continued.) (S11)

181-S. Control Systems Using Non-Contacting Thickness Gages. W. E. Van Horne. *Iron and Steel Engineer,* v. 33, Feb. 1956, p. 96-100; disc., p. 100.

Use of noncontacting gages and accessory equipment for continuously and automatically measuring, controlling, monitoring, recording and classifying in the production of cold rolled strip, hot rolled strip, continuous galvanized strip and electrolytic tinplate. Graphs. (S14, F23, ST, Sn)

182-S. How to Calibrate Your Gage-Blocks. Frederick O. Hutchinson. *Machinery,* v. 62, Mar. 1956, p. 160-166.

Precision gage-blocks can be accurately calibrated in your own plant with a few pieces of simple equipment and careful attention to prescribed rules. Photographs. (S14, ST)

183-S. Precision to a Fraction of a Light Wave. M. S. Hoskins. *Machinery,* v. 62, Mar. 1956, p. 190-193.

Interferometer and its use in evaluating gage blocks for flatness and parallelism as well as for size. Photograph, diagrams. (S14)

184-S. How Statistical Techniques Solve Metalworking Problems. II. Chester R. Smith. *Metal Progress,* v. 69, Mar. 1956, p. 76-78.

Preplanning and statistical design of experiments can result in considerable savings. Example is given of a designed experiment that required less than half the time and material of a conventional investigation. Diagrams, table. (S12, Ti)

185-S. Nondestructive Testing in Construction of the Aircraft Carrier Saratoga. John L. Cahill. *Nondestructive Testing,* v. 14, Jan.-Feb. 1956, p. 16-18.

Procedures followed in radiographing in the field all the structural and pipe welds. Applications of magnetic particle inspection, the oil-penetrant method, ultrasonic inspection and a portable spectroscope. Photographs. (S13)

186-S. Inspecting and Testing Lead Linings. Kempton H. Roll. *Nondestructive Testing,* v. 14, Jan.-Feb. 1956, p. 20-24.

Methods of testing and inspecting sheet-lead linings and bonded or lead-clad linings used in chemical-process industries. Includes penetrants, acid washes, ultrasonics and radiography. Photograph, diagrams, radiograph. (S13, Pb)

187-S. Improvements in High-Sensitivity Fluoroscopic Technique. E. L. Criscuolo and D. Polansky. *Nondestructive Testing,* v. 14, Jan.-Feb. 1956, p. 30-31, 40.

Performance of a high-sensitivity fluoroscope with a new high-power X-ray tube. Fluoroscopic technique and sensitivity curves. Tables, graphs, fluorograph. 5 ref. (S13)

188-S. Radiography in the Testing of Marine Equipment. W. L. Schwinn and G. R. Forrer. *Nondestructive Testing,* v. 14, Jan.-Feb. 1956, p. 32-35.

Radiography and its application in the inspection of weldments and castings. Procedures, technique and equipment. Graph, tables, diagrams, photograph, radiographs. (S13)

189-S. Modern Fluoroscopic Practices. W. R. Hampe. *Nondestructive Testing,* v. 14, Jan.-Feb. 1956, p. 36-40.

Development of industrial fluoroscopy. Five measurements for optimum sensitivity and three basic fluoroscopic arrangements. Discussion of fluoroscopic cabinet and electronic image amplifier. Table, graph, diagrams, photographs. 10 ref. (S13)

190-S. High-Speed Radiation Pyrometer. J. Vollmer, J. Duke and C. Wysocki. *Optical Society of America, Journal,* v. 46, March, 1956, p. 215-217.

A high-speed option for a time-tested radiation pyrometer has been made available. The response time for 98% response is less than or equal to 0.5 sec. It is compensated for ambient temperature effects, is transient free and makes use of existing charts and scales when used with null-balance electronic potentiometers. Diagram, graphs. 1 ref. (S16)

191-S. Aligning Large Machines With Optical Tooling. Harold H. Poett. *Tool Engineer,* v. 36, Mar. 1956, p. 100-103.

Applications and methods used for leveling, aligning and squaring spar mills, planers, and skin mills used in making aircraft parts. Diagrams, photograph. (S14)

192-S. German Alloy Steels. H. L. Waltl. *Automobile Engineer,* v. 46, Feb. 1956, p. 55-58.

Some notes on present practice to conserve scarce materials. Tables. 15 ref. (S22, AY)

193-S. The Utilization of Sonic Principles for Application to an Automatic Method of Casting Inspection. Milton J. Diamond. *Engineering Journal,* v. 3, Mar.-Apr. 1956, p. 38-42.

A completely automatic method of high production casting inspection is based on the application of electronic instrumentation to the theory that defective castings have different frequency of vibration from that of good castings. Photographs, diagrams (S12)

194-S. Physical Aspects of Absorptiometric Analysis. *Iron and Steel Institute, Special Report No.* 55, Jan. 1956, 37 p. + 4 plates.

Practical problems in the spectral analysis of colored solutions. Tables, graphs, diagrams, ultraviolet spectra. 20 ref. (S11)

195-S. Industry Learns From a Turbine Spindle Failure. R. G. Matters, R. E. Lochen, J. A. Dedinas and H. K. Ihrig. *Journal of Metals,* v. 8, Mar. 1956, p. 317-324.

Investigation of turbine failure revealed thermal cracks and flakes in radial planes near forging center as cause of rupture, and lack of hydrogen diffusion is believed to be basic factor in crack formation. Diagrams, photographs, graphs, micrographs, tables. (S21, Q26, ST)

196-S. An X-Ray Method for Studying Radiation Damage in Graphite. D. R. Chipman and B. E. Warren. *Knolls Atomic Power Laboratory and Massachusetts Institute of Technology, (U. S. Atomic Energy Commission),* KAPL-677, Feb. 1952, 28 p.

Using several orders of the (002) reflection, the complex Fourier coefficients are obtained from which a function is synthesized giving the distribution of changes in distances perpendicular to the graphite layers. Graphs, tables. 3 ref. (S19)

197-S. Portable Ultrasonic Unit Checks 1600 Ft. of Scroll-Case Weld. *Power,* v. 100, Mar. 1956, p. 96-97.

Application of transverse-wave method of ultrasonic scanning to checking welded seams in the scroll case of a 34,500-hp., 80-ft. head turbine, using portable equipment. Photographs, diagram. (S13)

198-S. Quality Control of Investment Castings. III. Charles Yaker. *Precision Metal Molding,* v. 14, Mar. 1956, p. 36 + 5 pages.

Process variables, their effect on quality, how they may be controlled. Table, graphs. (S12, E15)

199-S. The Evaluation of Some Related Heterocyclic Compounds as Analytical Reagents for Metals. Joseph Lawrence Walter. *University of Pittsburgh (U. S. Atomic Energy Commission),* NYO-6506, Sept. 1955, 142 p.

Thirteen compounds were prepared and their analytical aspects studied. Several were found to be highly selective and sensitive as organic analytical reagents. Graphs, diagram, tables. (S11)

200-S. Progress in Ultrasonic Examination. I. Automatic Immersed Scanning. C. W. J. Vernon. *Welding and Metal Fabrication,* v. 24, Mar. 1956, p. 93-97.

Use of this apparatus at Douglas Aircraft Co., Inc., and its counterpart by Kelvin & Hughes (Industrial) Ltd. Diagrams, photographs. (S13)

201-S. (English.) **Study on Carbides in Iron and Steel by Electrolytic Isolation Method. Isolation of Cementite From Carbon Steel.** Tomo-o Sato and Taiji Nishizawa. *Technology Reports, Tohoku University,* v. 20, no. 1, 1955, p. 121-130.

Hydrochloric acid procedure, and the suitable electrolytic conditions of the isolation of cementite from carbon steel. Evaluation of procedure using a hydrochloric acid cell; determination of suitable electrolytic conditions for cementite isolation. Diagram, graphs, table, photographs. 4 ref. (S11, M27, N8, CN)

202-S. (English.) **Increase of Precision in Spectrochemical Analysis of Steels Using Electronically Controlled High-Voltage Spark Source.** A. Bardocz and F. Varsanyi. *Acta Technica Academiae Scientiarum Hungaricae,* v. 13, nos. 3-4, 1955, p. 409-420.

Two such spark sources and one controlled by a rotary synchronous switch are compared, relative to the reproducibility of the analysis procedure. Graphs, diagrams, tables. 11 ref. (S11, ST)

203-S. (French.) **Radiation Pyrometers for Measuring Temperatures in a Transitory Regime.** René Chion. *Metaux, Corrosion-Industries,* v. 31, no. 365, Jan. 1956, p. 22-37.

Classical methods of pyrometry by radiation measurements and principal types of receivers useful, apparatus for pyrometry by sensitometry, and pyrometry apparatus using photosensitive elements. Diagrams, graphs, photographs. 10 ref. (S16)

204-S. (French.) **The Measure of Hydrogen Content in Steels. Analysis of Gases From Specimens Heated *in Vacuo* at Temperatures From 500 to 1100° C. (932 to 2012° F.).** J. Marot.

Revue de metallurgie, v. 52, no. 12, Dec. 1955, p. 943-960; disc., p. 960.

From this study, which was intended for a definition of the best temperatures for gas extraction, it appears that the 900° C. (1652° F.) range is the best one for gas microanalysis. Diagrams, graphs, photograph, tables. 29 ref. (S11, ST)

205-S. (German.) **Investigation of Thermo-Elements of the Iridium-Rhenium System.** G. Haase and G. Schneider. *Zeitschrift für Physik,* v. 144, nos. 1-3, 1956, p. 256-262.

Measurement of thermovoltage at temperatures up to 2450° C. The optimal thermocouple constitution is one with 70 wt.% of rhenium. Graphs, diffractograms. 4 ref. (S16, SG-a, Ir, Re)

206-S. (Polish.) **Possibility of Using the Akimov Apparatus for Sorting Steels.** Stanislaw Gorczyca and Juliusz Maydell. *Hutnik,* v. 22, no. 10, Oct. 1955, p. 362-368.

Apparatus works on principle that the magnitude of thermoelectric force depends on the chemical composition of the elements of a thermocouple. Relation of thermoelectric force to heat treatment of steel, to machined surface, and to content of elements present. Photograph, graphs, diagrams, tables. 8 ref. (S10, ST)

207-S. (Polish.) **Present State of the Development of the State Standards for Cast-Steel and Cast-Iron Castings.** Stanislaw Kobylinski. *Przeglad Odlewnictwa,* v. 6, no. 1, Jan. 1956, p. 22-24.

Standards for the casting industry include specifications for the raw-material charges, technical conditions, classification of materials for castings, and mold technology. Tables. 6 ref. (S22, CI)

208-S. (Russian.) **Strip Thickness Inspection Methods During Cold Rolling.** A. A. Druzhkov and A. U. Bodskii. *Stal',* v. 16, no. 1, Jan. 1956, p. 32-36.

Apparatus for measuring and regulating thickness in high-speed rolling operations. Photographs, diagrams. (S14, F23, ST)

209-S. (Spanish.) **Method of Spectrochemical Determination of Steels. Elimination of the Influence of Other Elements.** Hilaria Carrancio de la Plaza and Antonio Camunas Pluig. *Instituto del hierro y del acero,* v. 8, no. 41, Oct.-Dec. 1955, p. 755-763, disc., 763-764.

Proposed method of spectrochemical analysis of different metallic alloying elements of steels based on measuring the intensities of the spectral lines of the same element. Graphs, tables, photograph. 3 ref. (S11, ST)

210-S. (Spanish.) **Some Applications of Ultrasonic Testing Methods to Large Forged Pieces.** Antonio de Urioste Haya. *Instituto del hierro y del acero,* v. 8, no. 41, Oct.-Dec. 1955, p. 765-781.

Basic theories of ultrasonic frequencies, transmission and reflection methods of testing large forged pieces and their advantages. Diagrams, table, oscillograms, photograph. 25 ref. (S13)

211-S. **The Applications of Polarography to the Analysis of Electroplating Solutions.** Rafael Diaz. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 15-16.

Literature of polarography related directly to the analysis of electroplating solutions for major and minor constituents is reviewed. 21 ref. (S11, L17)

212-S. **Simultaneous Polarographic Determination of Cadmium and Zinc in Alkaline Cyanide Solutions.** T. A. Downey. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 70-73.

Results obtained by this method are not influenced by the common impurities found in alkaline cyanide cadmium and zinc plating baths, and, since it does not involve initial precipitation of the cadmium or zinc, it takes less time per determination. Graphs, tables. 4 ref. (S11, L17, Cd, Zn)

213-S. **Analytical Determination of Trace Constituents in Metal Finishing Effluents. VI. The Colorimetric Determination of Chromium in Effluents. VII. The Colorimetric Determination of Manganese in Effluents. VIII. The Colorimetric Determination of Ammonia in Effluents. IX. The Determination of Free Chlorine in Effluents.** Earl J. Serfass, Ralph F. Muraca and Donald G. Gardner. *American Electroplaters' Society, Proceedings,* v. 42, 1955, p. 1-2; p. 207-218.

Procedures for the determination of the hexavalent and total chromium, manganese, ammonia and chlorine content of effluents in the range of 5 to 50 p.p.m. Tables. 12 ref. (S11, L17, Cr, Mn)

214-S. **Modern Rapid Methods of Chemical Analysis for Quality Control.** Hubert C. Swett. *American Iron and Steel Institute, Preprint,* 1955, 11 p.

Description and comparison of spectrographic, magnetic, combustion and volumetric methods and the types of plants and laboratories in which they are used. (S11, ST)

215-S. **Film Thickness by X-Ray Emission Spectrography.** H. A. Liebhafsky and P. D. Zemany. *Analytical Chemistry,* v. 28, Apr. 1956, pt. 1, p. 455-459.

A method for measuring film thicknesses and for applying these measurements where more than one film is present. Graphs, table, diagram. 11 ref. (S14)

216-S. **Study of the Iodide Titration for Determination of Palladium.** Richard N. Rhoda and Ralph H. Atkinson. *Analytical Chemistry,* v. 28, Apr. 1956, pt. 1, p. 535-537.

A volumetric method for the determination of palladium in palladium-rich alloys based on the precipitation of palladous iodide, using the precipitate as its own indicator. Table. 11 ref. (S11, Pd)

217-S. **Polarographic Determination of Traces of Bismuth, Iron, Lead, Antimony, Nickel, Cobalt and Manganese in Refined Copper.** A. J. Eve and E. T. Verdier. *Analytical Chemistry,* v. 28, Apr. 1956, pt. 1, p. 537-538.

A procedure for the determination of some impurities in refined copper. 9 ref. (S11, Cu)

218-S. **Determination of Aluminum in Chromic-Phosphoric Acid Solutions.** C. Groot, R. M. Peekema and V. H. Troutner. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)* HW-40497, Jan. 1956, 29 p.

Colorimetric analysis is used. Diagram, tables, graphs. 15 ref. (S11, Al)

219-S. **Gamma Radiography of Metal Castings at Sandia Laboratory.** Louise D. Patterson. *U. S. Atomic Energy Commission,* TID-8004, Jan. 1956, 4 p.

Advantages of a relatively portable, inexpensive cobalt-60 gamma source for high-penetration radiography of materials. Photographs. (S13)

220-S. (English.) **On the K Spectrum of Aluminium and Its Oxide.** Bertil Nordfors. *Arkiv för Fysik,* v. 10, no. 3, 1956, p. 279-289.

In the K spectrum of aluminium the lines $\alpha 2$, $\alpha 1$, $\alpha 3$, $\alpha 4$ and β have been recorded and measured with a double target X-ray tube. Tables, graph, diagrams. 21 ref. (S11, Al)

221-S. (English.) **Investigation of a Pelton Wheel With the 31-MeV Betatron.** *Brown Boveri Review,* v. 42, Nov.-Dec. 1955, p. 478-480.

Sections up to 380 mm. thick examined. Photograph. (S13, ST)

222-S. (German.) **Determination of Rare Earths in Steel.** Heinz Krapp. *Archiv für das Eisenhüttenwesen,* v. 27, no. 2, Feb. 1956, p. 103-105.

Fluoride, peroxide and altered methods, separate determination of rare earths, application to alloy steels, separation of trivalent from four-valent elements. Table. 6 ref. (S11, ST, EG-g)

223-S. (German.) **Supersonic Visual Device and Its Application in Nondestructive Testing.** Herbert Trommler. *Archiv für das Eisenhüttenwesen,* v. 27, no. 2, Feb. 1956, p. 135-142.

Description and capacity. Diagram, photographs. 4 ref. (S13)

224-S. (Japanese.) **On Determination of Nonmetallic Inclusions in Chromium Steel by Hot H_2SO_4 Method.** Shizuya Maekawa and Miyoshige Ebihara. *Iron & Steel Institute of Japan, Journal,* v. 42, no. 2, Feb. 1956, p. 121-126.

Effect of heat treatment factors on reproducibility of determinations of chromic oxide and other inclusions. Graph, diagrams, tables. (S11, M27, SS, AY)

225-S. (Polish.) **Spectrographic Quantitative Analysis of Tin Bronzes.** *Przeglad Odlewnictwa,* v. 6, no. 2, Feb. 1956, p. 45-49.

Types of electrodes and apparatus for spectral analysis. Accuracy and advantages of this method. Determination of tin, zinc, iron, antimony, aluminum, lead and nickel. Photometric techniques. Graphs, tables, spectrogram. 6 ref. (S11, Cu)

226-S. (Russian.) **Detection of Inner Defects in Large Forged Items by Means of Ultrasonics.** F. M. Mikhailov. *Vestnik Mashinostroeniia,* v. 36, no. 2, Feb. 1956, p. 60-64.

Detection and determination of cause of cracks in forged shaft 800 mm. in diam. and 3.5 m. long. Graphs, diagrams, photographs, sonograms. (S13)

227-S. (Russian.) **Investigation of the Scattering of Ultrasonics in Metals.** L. G. Merkulov. *Zhurnal Teknicheskoi Fiziki,* v. 26, no. 1, Jan. 1956, p. 64-75.

Equipment, equations and measuring methods. Longitudinal and transverse waves in magnesium, iron and copper. Comparison of experimental and theoretical results. Tables, diagrams, graphs. 9 ref. (S13, Fe, Mg, Cu)

228-S. (Book.) **Temperature Measurement.** W. E. Belcher, Jr., Donald Robertson, and W. F. Hickes. 75 p. 1956. American Society for Metals, Cleveland, Ohio. $1.00.

Includes industrial temperature measurement with thermocouple pyrometers; total radiation and the optical pyrometers; and filled system and resistance thermometers. Diagrams, photographs, tables. (S16)

229-S. (Book.) **ASTM Standards on Copper and Copper Alloys.** 642 p. Dec. 1955. American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. $5.75.

Standard and tentative methods of testing, and specifications pertaining to copper and copper-base alloy products. (S22, Cu)

230-S. (Book.) **Advanced Analytical Chemistry.** Walter Wagner, Clarence J. Hull, and Gerald E. Markle. 282 p. 1956. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y.

Theory, instrumentation and analytical chemistry of the elements. (S11)

T

Applications of Metals in Equipment

114-T. Best Designs for Lead Installations. I. *Chemical Engineering,* v. 63, Mar. 1956, p. 228, 230, 232, 234.

Recommended practice for joining lead sheets and the construction of wood stave tanks, launders, towers and flues where lead is involved. Graph, diagrams. (To be continued.) (T29, Pb)

115-T. The Role of Nickel and Nickel Substitutes in Jewelry Making. K. H. Mairs and J. M. Williams. *Corrosion,* v. 12, Mar. 1956, p. 31-36.

Type 305 stainless steel showed the least tendency and with the copper-base alloys the greatest tendency toward corrosion. Alloys which develop protective films are more satisfactory than those which do not. Graphs, photograph, table. (T9, R5, Ni SS)

116-T. Use Light Metal Castings for Camera, Projector. *Finish,* v. 13, Mar. 1956, p. 30-31, 59.

Cast aluminum is used to achieve needed compactness and light weight. Photographs. (T9, Al)

117-T. Channel Struts Make Short Work of Construction. W. G. Patton. *Iron Age,* v. 177, Mar. 1, 1956, p. 67-70.

A system combining standardized construction, precision formed interchangeable parts and simplified assembly is achieving some startling results on new construction projects. Roll-formed members are assembled on the job, without any fitting, in less than one-third the usual time. Photographs, diagram. (T26)

118-T. Low Density Structural Laminates. *Mechanical World and Engineering Record,* v. 136, Feb. 1956, p. 83-85.

Applications and constructional features of plywood and other cores faced with steel, stainless steel, aluminum or other metals. Tables. (T26, ST, SS, Al)

119-T. Automakers Take to Aluminum Trim. *Steel,* v. 138, Feb. 27, 1956, p. 110-113.

Applications include grills, wheels, doorsill scuff plates, medallions, roofs and bodies, mostly in bold or silver anodized aluminum, but some in colors. Description of anodizing process. Diagrams, photographs. (T21, L19, Al)

120-T. Silicones in Metalworking. *Steel,* v. 138, Mar. 5, 1956, p. 92-96.

Lists 151 uses for silicones in design, production and maintenance, discusses a few of the more important ones. Photographs. (T5, Si)

121-T. Europe Accepts Food in Tubes. David N. Lewin. *Food Engineering,* v. 28, Mar. 1956, p. 60-61, 157.

Reasons for popularity of tube-packaged foods in Europe. Lists number of foods packaged in this manner. Discusses preparation of foods, protection of quality, coating problems, mechanical filling, in-tube sterilization, space and labor requirements. Photographs. (T10)

122-T. Thorium-Magnesium Sheet Useful for High Temperature Service. Alan V. Levy. *Materials & Methods,* v. 43, Mar. 1956, p. 114-117.

Light weight, strength at elevated temperatures, and good forming properties indicate this alloy applicable for new missiles and aircraft power plants. Corrosion resistance of HK31 alloy summarized. Tables, graphs, diagram, photographs. (T24, R general, Th, Mg)

123-T. How to Lengthen Condenser-Tube Life. H. A. Todhunter. *Power,* v. 100, Mar. 1956, p. 85-87.

Different alloys were tested, 70-30 cupro-nickel condenser tubes showing the least pitting. Photographs, graphs. (T25, Al, Cu, Ni)

124-T. (French.) Refractory Steels and Their Uses in the Construction of High-Temperature Regenerators. P. Villain. *Chaleur & Industrie,* v. 37, no. 366, Jan. 1956, p. 3-10.

Five different chromium steels for the construction of regenerators used by industry for regenerating lost heat, their refractory behavior, creep resistance, stability and weldability. Graphs, tables. (T25, Q3, K9, ST, Cr, Ni)

125-T. (Italian.) Using Sintered Materials in the Automotive Field. E. S. Sgambetterra. *Metallurgia Italiana,* v. 47, special supplement to no. 12, Dec. 1955, p. 27-31; disc., p. 31-32.

Modern processes and equipment; special physical and mechanical properties of some products not obtainable by other means; status in competition with other technologies for manufacture of small metal parts. Photographs, graphs. (T21, H general)

126-T. (Italian.) Researches on the Craterization and New Applications for Hard Metal Tools. C. A. Bertella. *Metallurgia Italiana,* v. 47, special supplement to no. 12, Dec. 1955, p. 35-40.

Review of British and American journal articles on applications of hard metal tools on multiple automatic lathes, flexible spindle machine tools, hand-operated machines, high-speed machines, and helical plate precision milling machines for aircraft parts. Diagrams, micrographs. 15 ref. (T5, G17)

127-T. (Slovak.) Railway Cars for Transporting Oxygen. Pavel Hrbal'. *Zvaranie,* v. 4, no. 11, Nov. 1955, p. 329-334.

Types of cars and tanks and connections between tanks; carrying and delivery capacity. Advantages, safety and economy of these special cars compared to truck transport. Diagrams, photograph, table. (T23)

V

Materials

General Coverage of Specific Materials

67-V. Ultra-High-Strength Steels. K. J. Irvine. *Aircraft Production,* v. 18, Mar. 1956, p. 84-89.

Structures, properties and problems associated with steels in the tensile-strength range of 100 to 150 tons per sq.in. Graphs, table. 12 ref. (T24, ST)

68-V. Zirconium-Fabrication Techniques and Alloy Development. C. E. Lacy and J. H. Keeler. *ASME Transactions,* v. 78, Feb. 1956, p. 427-433.

Fabrication techniques by which zirconium and its alloys are successfully made into various product forms, neutron-absorption characteristics, mechanical properties, and corrosion resistance of zirconium and some zirconium alloys. Diagrams, graphs, photographs, tables. 25 ref. (F general, G general, Zr)

69-V. Composition and Application of Brass Foundry Alloys. Harry St. John. *Foundry,* v. 84, Mar. 1956, p. 110-113.

Compositions, properties and applications of manganese bronze, yellow brass and semired brass alloys. Tables, photographs. (Cu)

70-V. Improving Performance of High-Speed Steel Tools. F. J. Pohlmeyer. *Machinery,* v. 62, Mar. 1956, p. 152-159.

Type of steel, manufacturing process and heat treatment must be carefully controlled to produce high-quality tools. Photographs, table. (T6, TS)

71-V. Rare Earth Stainless Steels. H. O. Beaver and B. T. Lanphier. *Materials & Methods,* v. 43, Feb. 1956, p. 96-98.

Rare earth additions to stainless steels improve mechanical and hot working properties. Among new alloys are a sulfuric-acid resistant material and a corrosion resistant high-temperature valve steel. Photographs, tables, graph. (Ce, La, SS)

72-V. Titanium Gets Its Second Wind. *Steel,* v. 138, Feb. 27, 1956, p. 69-71.

Increase in output and demand, new uses in aircraft industry and other fields, future of titanium powder metallurgy and of casting. Table, photographs, graph. (A4, T24, H general, E general, Ti)

73-V. A Guide to Tool Steels & Carbides. *Steel,* v. 138, Mar. 12, 1956, p. 1S-40S.

Companies offering toolsteels, carbides and ceramic cutting tools. Primary applications, trade names, types, chemical analyses. Suggested quenching, media machinability rating, effects of hardening on tolerance. (SG-j, TS, C-n)

74-V. Brass Foundry Alloys. IX. Harry St. John. *Foundry,* v. 84, Apr. 1956, p. 102-105.

Compositions and applications of brass foundry alloys and the high strength of red brasses and bronzes. Photographs, tables. (Q23, Cu)

75-V. The Manufacture and Properties of High-Strength Nickel-Tungsten Alloys. M. Davis, C. E. Densem and J. H. Rendall. *Institute of Metals, Journal,* v. 84, Feb. 1956, p. 160-164.

Desirable qualities of an oxide-coated cathode core metal. It is shown that nickel-tungsten alloys fulfill several of these requirements. Study made of tensile strength, electrical resistivity, thermal conductivity, and of work hardening and annealing behavior. Graphs, tables, phase diagram. 5 ref. (Q23, P15, P11, J23, Ni, W)

76-V. (Italian.) Malleable Cast Irons. P. Bruzzi. *Fonderia,* v. 5, no. 1, Jan. 1956, p. 1-9.

Properties, characteristics, uses. Micrographs, tables, photographs. (CI)

77-V. Nickel-Free and Low Nickel Austenitic Stainless Steels. D. J. Carney. *American Iron and Steel Institute, Preprint,* 1955, 12 p.

Structural diagrams and properties for Cr-Mn-N steels; comparison with other types of stainless steels; fields of application. Table, graphs, diagram. 1 ref. (SS)

78-V. Investigation of the Soundness of Wrought Zirconium. Verne Pulsifer. *Armour Research Foundation. (U. S. Atomic Energy Commission),* TID-5184, Oct. 1953, 111 p.

Nondestructive test equipment and methods; bonding of zirconium by hot rolling; metallographic examination of "Zircaloy" tubing. Micrographs, photographs. 110 ref. (S general, M general, Zr)

79-V. Investigation on the Development of Low-Carbon Low-Alloy Steels With Electrolytic Manganese. S. Visvanathan, S. N. Anant Narayan and P. K. Chakravarty. *Tisco,* v. 3, Jan. 1956, p. 19-38.

Possibility of utilizing electrolytic manganese for the production of alloy case-hardening and weldable high-tensile steels. Experimental compositions and properties of forged bars from experimental heats. Graphs, tables. 51 ref. (Mn, AY, CN)

80-V. (Japanese.) **Studies on the Boron-Treated Spring Steel TS50B60. I.** Yoichi Yasuda and Kichiya Suzuki. *Iron and Steel Institute of Japan, Journal,* v. 42, no. 2, Feb. 1956, p. 105-110.

Inclusions, transformations, heat treatability and grain growth characteristics of boron-treated chromium steel. Comparisons with silicon-manganese, manganese - chromium and chromium-vanadium steels. Tables, graphs, micrographs, diagram. 12 ref. (AY, CN)

81-V. (Japanese.) **Influence of Manganese and Carbon on the Properties of W-Cr Nondeforming Tool Steel. I.** Naomichi Yamanaka and Kunio Kusaka. *Iron and Steel Institute of Japan, Journal,* v. 42, no. 2, Feb. 1956, p. 111-116.

Measurements of critical point, Jominy hardenability, S-curve for the transformation of austenite, quenched and tempered hardness, retained austenite, dimensional changes, toughness. Table, graphs. 8 ref. (N8, J26, P10, Q23, Q29, TS)

82-V. (Japanese.) **Facts About Titanium and Its Alloys. II.** Zenichiro Takao and Hidetake Kusamichi. *Iron & Steel Institute of Japan, Journal,* v. 42, no. 2, Feb. 1956, p. 127-138.

Compositions, properties, structure and fabrication procedures. Photograph, tables, graphs, micrographs. 14 ref. (Ti)

83-V. (Russian.) **Iron-Copper-Graphite Porous Anti-Friction Alloys.** V. E. Mikriukov and N. Z. Pozdniak. *Vestnik Mashinostroeniia,* v. 36, no. 2, Feb. 1956, p. 52-56.

Structure, composition and physico-chemical properties of this alloy. Tables, graphs, micrographs. 4 ref. (SG-c, Fe)

84-V. (Book.) **Titanium. v. IV.** A. D. McQuillan and M. K. McQuillan. 466 p. 1956. Academic Press, 125 East 23rd Street, New York 10, N. Y.

Basic properties of titanium and its alloys. Ore processing, industrial production, reaction with gases, corrosion and metallographic techniques. (Ti)

NATIONAL METAL CONGRESS

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POSITIONS OPEN

East

METALLURGIST: Multiplant manufacturer requires graduate engineer to control entire nonferrous investment casting process in New England plant. Nonferrous foundry experience essential. Moving expenses paid. Excellent conditions and opportunity for ambitious engineer. Send resume. Box 5-5.

TECHNICAL DIRECTOR: Leading metals producer is seeking a technical director to plan and administer an extensive program of research and development. He will be responsible for development of new products, new processes and new uses for raw materials. Latest scientific equipment and testing facilities available in centralized research laboratory. Company known as leader in scope and stress of research. Director will be member of top management. He must have outstanding record in research administration, as well as a technical background in metals and metallurgical engineering. Prefer man about 50; preferably with a doctorate from leading technological institute. Starting salary open, but may be between \$20,000 and \$35,000. Box 5-10.

PLANT METALLURGIST: Central Massachusetts manufacturer of well-known hand and electric tools has attractive opening with good future for mechanically-minded metallurgist or mechanical engineer to participate in process development, quality control, product improvement, metallography and testing. Considerable emphasis will be placed on high speed steel, plain carbon and alloy steels, cast iron and heat treatment problems. Prefer young married man, about 25 to 35 years old, who would like to settle down in a small pleasant community. Good personality important. Send resume and salary range. Box 5-15.

METALLURGIST: As process metallurgist and quality control in brass mill manufacturing phosphor-bronze, nickel-silver, cupro-nickel and brass in the form of strip, wire and rod. Reply fully in writing giving age, experience and salary desired to: Personnel Dept., The Riverside Metal Co. Division, H. K. Porter Co., Inc., Riverside, N. J.

PHYSICAL METALLURGIST: Attractive and responsible position in research department of nationally known manufacturer of gages, valves, industrial and electronic instruments. Exceptional opportunity for individual development. Applicant must have a B.S. degree in metallurgical engineering. Experience in welding, high-temperature alloys and service analysis work is preferred but not essential. Starting salary is open but in vicinity of \$6000 to \$7000. Please send resume giving details of education, experience, age, references and salary requirements to: O. L. Lemoine, Employment Manager, Plant Personnel Dept., Manning, Maxwell & Moore, Inc., 250 East Main St., Stratford, Conn.

ENGINEER: Metallurgical, chemical or mechanical engineer, M.S. or Ph.D., to 35. To assist metallurgical organization in liaison with educational institutions. Teaching experience essential, research or related industrial experience in a metallurgical or chemical industry at a responsible level desirable. Traveling. Location New York. Box 5-20.

EXECUTIVE ENGINEER: With background in design and fabrication of metal honeycomb core, to set up and run this new division of an established metals producer. Compensation will be related to experience in this field and to growth. Please give full details in complete confidence. Box 5-180.

Midwest

METALLURGIST: Northern Ohio manufacturer of electrical equipment has opening in control and development laboratory for recent graduate. Some work experience desirable but not essential. Opportunity to gain diversified experience. Including work with ferrous and nonferrous metals, heat treating, joining and allied fields. Contact with manufacturing personnel and suppliers. Send complete resume, including salary requirements. Box 5-25.

METALLURGICAL ENGINEER: Background in joining required. Recent graduate with experience or college specialization in joining. To aid in design of electrical machinery and development techniques with manufacturing personnel and suppliers. Send complete resume, including salary requirements. Box 5-30.

METALLURGICAL ENGINEER: Western New York gray iron foundry requires engineering graduate with experience to handle development and process control in foundry and liaison with those responsible for design and machining of green sand and shell molded castings. Box 5-35.

FOUNDRY ENGINEER: With at least 10 years foundry background including some ferrous experience. Resume should include present and required salary and detailed description of methods used to control foundry processes.

FOUNDRY SALES MANAGER: With degree in metallurgy or metallurgical engineering and previous ferrous experience. RESEARCH AND DEVELOPMENT ENGINEERS: With forging and machine shop background to develop processes, estimate costs, etc. Please write to: Employment Office, Metals Processing Division, Curtiss-Wright Corp., 162 Grider St., Buffalo 15, N. Y.

MECHANICAL - METALLURGICAL ENGINEER: Well-established forging company has exceptional opportunity for mechanical-metallurgical engineer, 30 to 40 years old, with experience in product, process and tool design. Must have potential for rapid advancement. Salary open. Send resume. Box 5-40.

ONLY THE BEST: We need competent metallurgist who likes people—therefore enjoys success in technical sales; who knows ferrous melting; who likes to guide his own destiny—therefore aspires to management; who is resourceful, imaginative, creative — therefore above average. Knowledge of tool, stainless, superalloys desirable. Home base will be Detroit area. Tell us about yourself and we'll do the same. WalMet, 1999 Guoin, Detroit 7, Mich.

RESEARCH ASSISTANTSHIPS: Few still available to students planning graduate work towards M.S. or Ph.D. degrees. Research areas include molding practice, malleable iron, eutectoid transformations, intermetallic compounds, temper brittleness. Student will carry full graduate load and use results of research as graduate dissertation. Write: Dept. of Metallurgy, University of Wisconsin, Madison 6, Wis.

ASSISTANT or ASSOCIATE PROFESSOR: Permanent academic position in metallurgical engineering, large Midwest university, teaching advanced undergraduate, graduate courses, and research. Prefer relatively young Ph.D. with interest in thermodynamics and solid state physics. Will consider others. Salary and rank dependent upon qualifications. Box 5-45.

FOUNDRY METALLURGIST: Development and service work involving moderate travel for large corporation producing wide variety of melting materials. Must have sound metallurgical education and wide knowledge of iron and steel foundry technology. Box 5-50.

TOOLSTEEL METALLURGIST, RESEARCH ASSOCIATE: Conduct research on high-speed toolsteels. M.S. or Ph.D in metallurgy preferred. Will consider B.S. with added experience. Three to five years experience in melting, processing, application or use of toolsteels. Salary commensurate with experience. Address complete resume, experience, education and salary requirements to: R. D. Crissman, Universal-Cyclops Steel Corp., Bridgeville, Pa.

RESEARCH METALLURGIST: With associate status. Capacity for supervising technical and semitechnical personnel. College degree in metallurgy essential. Five to eight years experience in vacuum technology and/or process development. Salary commensurate with experience. Address complete resume, experience, education and salary requirements to: R. D. Crissman, Universal-Cyclops Steel Corp., Bridgeville, Pa.

TEACHER-PHYSICAL METALLURGY: Opening on staff of metallurgical engineering department in central state university for person interested in developing a program in theory of metals. Salary and rank dependent upon qualifications of applicant. Box 5-55.

METALLURGIST or METALLURGICAL ENGINEER: With B.S. degree, with or without previous nonferrous wire mill experience, to control manufacturing processes and conduct developmental projects in nonferrous wire department of large company providing attractive wage and additional benefits to aggressive engineer. Box 5-60.

METALLURGICAL ENGINEER: Needed in materials and process engineering group at large plant manufacturing wide diversity of electrical equipment. Engineering consultation, shop follow up and development projects in selection, heat treatment and fabrication of variety of ferrous and nonferrous metals. Box 5-65.

DESIGN ENGINEERS: Mechanical, structural, electrical. Leading Northwestern Ohio manufacturer of industrial equipment requires high-caliber graduate engineers or equivalent with one to five years experience. Excellent promotional possibilities for men who wish to apply their talents to creative projects and establish a solid future. Write giving details of education, work history, personal data and salary requirements. All replies confidential. Box 5-70.

RESEARCH METALLURGISTS: Research and development openings for Ph.D., M.S. or B.S. degrees in metallurgy, chemical engineering or mechanical engineering. Research and development of ferritic, austenite, and refractory alloys and process development. Vacuum melting and inert atmosphere fabrication pilot plants. Specialty steel producer in Pittsburgh area. Experience necessary. Send detailed resume of experience, education, references, salary desired. Box 5-75.

METALLURGICAL ENGINEERS: Challenging work in specialty steel field. Openings in production metallurgical group and laboratory in mill producing high speed steels, toolsteels, stainless and high-temperature metals and many specialty steels. Will consider experienced men or recent graduates. Plants located in Bridgeville and Titusville, Pa. Send complete and detailed resume of education, experience, references and salary desired to: R. D. Crissman, Personnel Dept., Universal-Cyclops Steel Corp., Bridgeville, Pa.

FOUNDRY METALLURGIST: To take charge of all foundry operations and quality control of company producing investment castings. Applicant should have experience with ferrous and nonferrous alloys, vacuum techniques. Should be capable of initiating alloy development programs, and generally, be development minded. Salary commensurate with ability and experience. Please forward resume, Box 5-215.

METALLURGIST: Recent graduate or exceptional man with at least three years completed in recognized metallurgy course. Laboratory and mill work on ferrous and nonferrous metallurgy in process and product development. Excellent opportunity for right man to advance. Pittsburgh District. Send resume of education, experience and salary desired. Box 5-230.

Foreign

METALLURGICAL DIRECTOR: First substantial cast iron and alloy steel foundry and machine shop in Lima, Peru, presently being set up, needs experienced man in good health, from 40 to 60 years of age, to take complete charge of the foundry, heat treating shop and metallurgical laboratory. He will have several Peruvian graduate engineers for trainee-assistants in each department. Salary and expenses will be commensurate with ability, profit-sharing plan probable. Job will be in nature of missionary enterprise . . . this is a challenging situation for a pioneering proposition. Box 5-210.

POSITIONS WANTED

METALLURGIST: M.S. degree, age 32, family, veteran. Seven years experience in fundamental and applied research in physical and mechanical metallurgy includes X-ray diffraction, vacuum and arc melting, phase diagrams. Prefers research or production, Upper Midwest. Box 5-80.

METALLURGIST: B. of Met. E., veteran, age 29, married. Four years in foundry, welding and processing of metals. Four years research and development in fabrication of nonferrous, ferrous and high-temperature materials for well-known Government laboratory. Desires position of responsibility in Midwest or West. Minimum salary $9000. Box 5-85.

METALLURGICAL ENGINEER: B.S. degree, veteran, E.I.T. license, married, age 31. Six years diversified experience in research and trouble shooting, heat treating, forging, machining, forming, casting and other fabricating operations of ferrous and nonferrous materials. Active in inventory reduction, establishing purchase and production control specifications. Prefers East. Box 5-90.

GRADUATE METALLURGIST: English, age 29, married, no children. Presently employed in Southern Ontario, Canada. Extensive supervisory experience in B.O.H. steel, high-grade cast iron and nonferrous foundry, chemical industries. Corrosion research, metallography, physical testing, heat treatment, metallurgical analysis, report writing, personnel training, service failure investigations and industrial photography. Will travel. Desires responsible, progressive position, anywhere. Box 5-95.

METALLURGIST: B.S. degree, age 30. Five years diversified experience with accessories, farm equipment and jet engine manufacturers, desires to join progressive manufacturing or heat treating firm. Education, experience and interests lie with material selection and processing, with emphasis on steel selection, heat treatment and surface protection. Will relocate. Box 5-100.

PHYSICAL METALLURGIST: Age 29, Ph.D. degree, six years experience in research and teaching desires teaching position. Available Sept. 1, no location preference. Box 5-105.

NUCLEAR METALLURGIST: Age 35, research and development manager, 10 years leading eastern industrial laboratory, recognized authority in field, many research and development publications, minimum salary $14,000. Location unimportant. Available September. Box 5-110.

METALLURGICAL ENGINEER: With proven administrative ability, desires to relocate with small to medium-size company offering opportunity for growth in management. Fourteen years experience in research, development and production, ferrous and nonferrous includes foundry operations, mill fabrication, equipment design, melting and fabrication of reactive metals, vacuum metallurgy. M.S. degree, age 36, prefers Southwest. Box 5-115.

METALLURGIST: Ph.D. in metallurgy, age 32, married. Experience includes four years industrial research in alloy studies of classified materials. titanium research, high-temperature materials. Consulting, liaison contacts, report writing. Interested in responsible position with greater opportunities for accomplishment. Box 5-120.

PHYSICAL METALLURGIST: Engineer, recent D.Sc., age 38. Experience in metallography, heat treatment, process and material specification, stress and failure analysis, supervision, research and teaching. Desires research, development or supervisory position in West or Southwest. Box 5-125.

RESEARCH METALLURGIST: Age 41, B.S. degree in metallurgy. Diversified experience in ferrous and nonferrous alloys. Extensive knowledge of welding, heat treating, fabricating, cost control, etc. Several years foundry experience in bronze and nickel-copper alloys. Interested in company that wants results and not a YES man. Box 5-130.

PATENT LAWYER: Registered, age 43, admitted State and Federal bars, ACA, IHE, ASM. Widely diversified proficiency in patent and trademark prosecution, interferences, litigation and contract negotiation. Experienced in chemical, electronic, complex mechanical arts. Full or part time. Northeast. Box 5-135.

METALLURGICAL ENGINEER: Age 33, with six years diversified foundry and engineering experience, seeks position as sales engineer with progressive foundry. Box 5-140.

METALLURGIST: Ph.D., age 34, family. Nine years industrial and research experience. Three years in corrosion research. Four years in titanium development, in physical metallurgy research, alloy development, oxidation, corrosion and process development. Looking for challenging position with more responsibility and opportunity for growth. Box 5-145.

MANAGER — METALLURGICAL ENGINEER: B.S. in chemical engineering, registered metallurgical engineer with mechanical background. Fifteen years operational and metallurgical experience in the steel industry coupled with five years as project engineer and manager in engineering and construction of new chemical and metallurgical plants. Desires key position with management level responsibilities. Resume on request. Box 5-150.

METALLURGICAL ENGINEER: Holding responsible position with major airframe manufacturer. Thoroughly familiar with aircraft titanium problems and usage. Broad laboratory experience with all aircraft materials and fabrication practices. Regularly consulted by all departments of present employer. Experience and skill in technical writing. Supervisory experience. B.S. degree, age 30, married, family. Box 5-235.

METALLURGIST: B.S. in metallurgical engineering. Age 29, married, children. Three years experience in secondary copper refining, five years in nonferrous foundry including experimental and development work, quality control and supervision. Cost and quality conscious. Prefers Missouri or Illinois. Box 5-155.

METALLURGICAL ENGINEER: B.S. degree, age 28, married, veteran. Almost six years experience with major manufacturer of pipe and tubing since graduation, six months laboring in blast furnace department, six months research in blast furnacing, three and one-half years metallurgical department involving control, development and failure analysis. Currently claim analyst (quality) for company's five plants under sales department. Desires management level position in operating metallurgy or metallurgical development. Any location considered. Complete resume on request. Box 5-160.

METALLURGIST: M.S. in metallurgy from Northwestern University in June. Age 25, single, draft status 4-F. Courses in physical metallurgy including metallography, phase diagrams, transformations, diffusion, X-rays, mechanical metallurgy, including plastic deformations, creep, and thermodynamics, including chemical thermodynamics and equilibrium. Research and teaching assistantships. Desires development work, any location. Box 5-165.

METALLURGICAL DIRECTOR or EXECUTIVE: Graduate metallurgist with 20 years varied experience. Internationally known speaker and writer. Capable administrator. Experience includes light metals, nonferrous, low alloy and stainless steels, and titanium, almost all casting methods and forming and welding of sheet metal assemblies. High priced but has outstanding ability. Box 5-170.

AIRCRAFT METALLURGIST: Age 34, B.S. degree in metallurgy. Desires position as laboratory supervisor. Thirteen years experience in charge of metallurgical corrosion and X-ray sections with two leading aircraft companies. Box 5-175.

METALLURGIST: Recent graduate, interested in production development problems of melting, coating, alloying, rolling, drawing and extruding of light alloys. Seeks job on any reasonable terms and pay. Prepared to work in any part of the world. Single, age 22. Box 5-220.

DIRECTOR OF INDUSTRIAL RESEARCH: Thirteen continuous years in responsible charge of metallurgical research. M.S. degree plus predoctorate study. Capable of inspiring people. Skilled in presenting reports, verbal and written, in nontechnical language. Experienced in all phases of heat treatment, heat transfer, metal fabrication, mechanical testing, precision casting, continuous casting, phases of arc welding and preparing specifications. Active in local A.S.M., listed in Who's Who in Engineering. Desires position with medium or large corporation in Chicago or vicinity. Box 5-225.

11th Metallographic Exhibit

CLASSIFICATION OF MICROS
(Optical and Electron)

Class 1. Irons and steels.
Class 2. Stainless steels and heat resisting alloys.
Class 3. Aluminum, magnesium, beryllium, titanium and their alloys.
Class 4. Copper, nickel, zinc, lead and their alloys.
Class 5. Uranium, plutonium, thorium, zirconium and reactor fuel and control elements.
Class 6. Metals and alloys not otherwise classified.
Class 7. Series showing transitions or changes during processing.
Class 8. Welds and other joining methods.
Class 9. Surface coatings and surface phenomena.
Class 10. Results by unconventional techniques (other than electron micrographs)
Class 11. Slags, inclusions, refractories, cermets and aggregates
Class 12. Color prints in any of the above classes (no transparencies accepted)

Entries are invited in the 11th ASM Metallographic Exhibit, to be held at the National Metal Exposition in Cleveland, Oct. 6 through 12, 1956.

RULES FOR ENTRANTS

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable. Photographic prints should be mounted on stiff cardboard; maximum dimensions 14 by 18 in. (35 by 45 cm.) Heavy, solid frames are unacceptable. Entries should carry a label on the *face* of the mount giving:

Classification of entry
Material, etchant, magnification
Any special information as desired

The name, company affiliation and postal address of the exhibitor should be placed on the *back* of the mount.

Entrants living outside the U. S. A. should send their micrographs by first-class letter mail endorsed "Photo for Exhibition—May be opened for customs inspection".

Exhibits must be delivered before Oct. 1, 1956, either by prepaid express, registered parcel post or first-class letter mail, addressed to:

ASM Metallographic Exhibit
7301 Euclid Ave.
Cleveland 3, Ohio

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which, in the opinion of the judges, closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $100, will also be awarded the exhibitor whose work is judged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's national headquarters in Cleveland.

All photographs may be retained by the Society for one year and placed in a traveling exhibit to the various Chapters. They will be returned to the owners in May 1957 if so desired.

38TH NATIONAL METAL CONGRESS AND EXPOSITION

CLEVELAND, OHIO **OCTOBER 6 to 12, 1956**

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